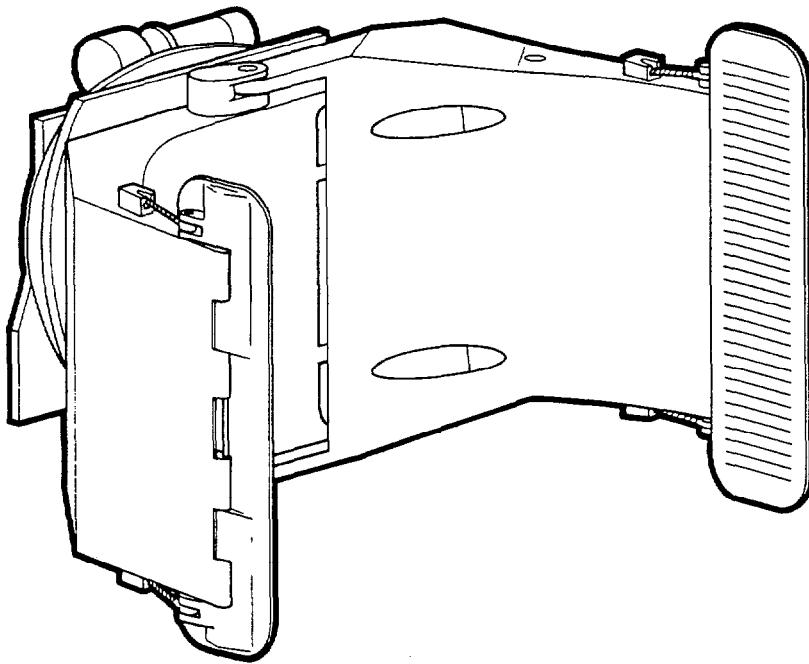




Service Manual

70E Roll Clamp



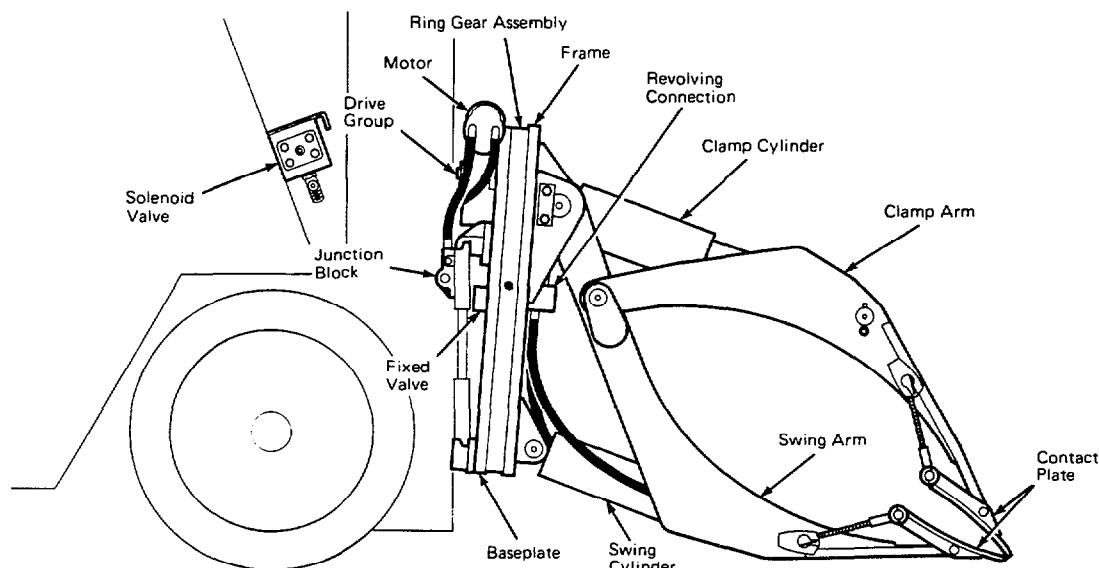
P/N 667442

cascade®
corporation

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This manual provides the periodic maintenance, troubleshooting, service procedures and installation instructions for the Cascade 70E Paper Roll Clamp. There are two basic units: mill unit and converter unit. The mill unit is equipped with single-stage clamp cylinders and will handle rolls 30" to 60" in diameter. The converter unit has two-stage cylinders and will clamp any roll up to 60" in diameter.

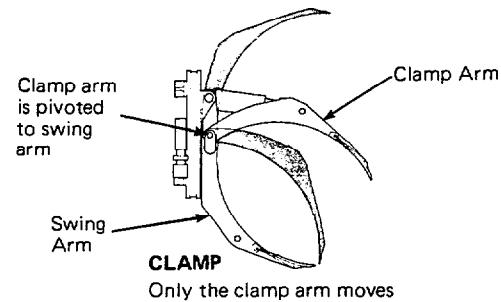
The Cascade 70E Paper Roll Clamp is a three function attachment. The functions are:

CLAMP—A Mill unit can clamp rolls between 30 and 60 inches in diameter. A Converter unit can clamp rolls of any diameter up to 60 inches.

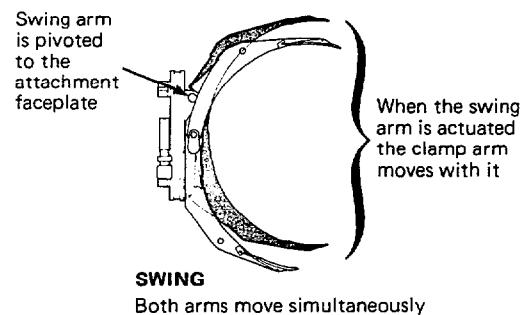
SWING—A clamped load can be positioned side-to-side or up and down, depending on how the attachment has been rotated, without affecting clamping force.

ROTATE—360°, continuously.

To perform all three functions, the 70E is equipped with a unique hydraulic system. The system makes it possible to operate all three functions with only two truck auxiliary valves in conjunction with a truck-mounted solenoid valve (supplied with your attachment).



NOTE: Mill units can handle 30 to 60 inch rolls **only**



Section 1 Periodic Maintenance

1.1 100 Hour Maintenance

Every time the lift truck is serviced or every 100 truck operating hours, whichever comes first, the following maintenance should be completed.

- Check the edge of the contact plates for wear or sharp nicks that could damage or tear paper rolls. Replace the contact plates if necessary.
- Check the pressure (see paragraph 2.1-1 on page 13-3) by performing the pressure test outlined in the Clamp Circuit Troubleshooting, page 13-7, and the Swing Circuit Troubleshooting, page 13-9.

1.2 500 Hour Maintenance

In addition to the 100 hour maintenance, perform the following maintenance every 500 truck operating hours.

- Lubricate the ring gear/bearing assembly with wheel bearing grease. Rotate the clamp one full turn during lubrication.
- Retorque the mounting hook capscrews using the torque specifications on pages 13-16 and 13-34.
- Remove the plug on the back of the baseplate and retorque all the ring gear/bearing assembly capscrews to 65 – 70 ft.-lb.
- Remove the plug on the side of the rotator drive gear case and fill to capacity with Cascade Rotator Drive Lubricant (part no. C-656300) or Keystone WG-1.

1.3 1000 Hour Maintenance

In addition to the 100 and 500 hour maintenance, perform the following every 1000 truck operating hours.

- Check the pivot point bushings on the cylinders, arms, and rotator frame for worn, deeply scratched or marred inside surfaces. Replace if any of these symptoms exist. See pages 13-17, 13-19, 13-24, and 13-35.

1.4 2000 Hour Maintenance

In addition to the 100 and 500 hour maintenance, perform the following every 2000 truck operating hours.

- Replace all pivot point bushings. See pages 13-17, 13-19, 13-24, and 13-35.

2.1 General Procedures

Please read this section before you begin troubleshooting.



WARNING: Before servicing any hydraulic component, open the arms 1-2", turn the truck off and relieve all pressure in the system by opening and closing all auxiliary valves. Be sure you complete this procedure with the solenoid valve activated.

After completing any service procedures, always test each function (swing, rotate, and clamp) through 5 complete cycles. First test the clamp empty, to bleed off any excess air trapped in the system. Then test each function with a load, to make sure the clamp operates correctly before returning it to the job.

2.1-1 Truck System Requirements

Pressure: Your truck should supply enough pressure to adequately handle the heaviest load.
PRESSURE MUST NOT EXCEED 2000 psi.

Volume: 15-20 g.p.m.

2.1-2 Tools Required

In addition to a normal selection of hand tools, you will need:

- 1 No. 6 Straight thread connector fitting (with O-ring).
- 2 each No. 8 and No. 6 reducers.
- 1 metal plug (No. 8, 37° flared male) for hose.
- 2 metal caps (No. 8, 37° flared female) for ports.
- 2 pressure gauges that are capable of reading pressures up to 2500 p.s.i.
- 2 needle shutoff valves, rated at 2500 p.s.i.
- 1 voltmeter or test light.
- 1 ohmmeter.

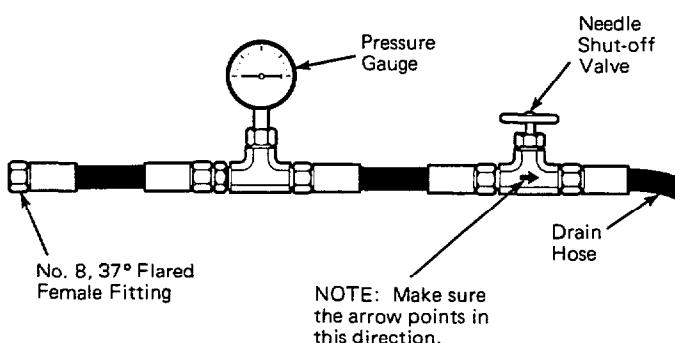
2.1-3 General Pressure Test & Bleed Procedures

For maximum accuracy, you should set one of your pressure gauges up as indicated in this illustration. The needle valve and drain line will allow you to bleed off trapped air in the system before you take your pressure readings.

Unless otherwise indicated, you should always use this pressure gauge, with the needle valve and drain line, for troubleshooting.

To use the pressure gauge, use the following procedures to bleed the air from the system before reading your gauge:

- Open the arms 1-2".
- Turn the truck off and relieve any pressure in the system by opening and closing the truck valves.
- Install the pressure gauge as indicated in the test checklist, on the following pages, for each circuit.



Section 2 Troubleshooting

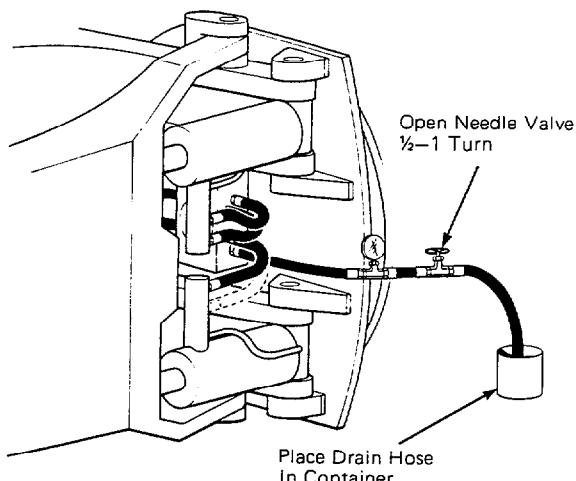
2.1-3 General Pressure Test & Bleed Procedures (Cont.)

— Place the drain hose in an empty container.

— Open the needle valve $\frac{1}{2}$ -1 turn, maximum.



WARNING: Before operating the truck, make sure there are no people in the vicinity of the drain hose.



— Open the truck valve and power the truck at idle.

— Wait approximately 4-5 seconds and close the needle valve tightly.

— Close the truck auxiliary valve.

— You are now ready to read the gauge.

2.1-4 Get All The Facts Before You Begin Working On The Clamp

It is extremely important to gather all the facts regarding the problem before you begin your service procedures.

The best way to gather the information is to talk with the operator. Ask for a complete description of the malfunction. The following guidelines will help you decide where to begin your troubleshooting procedures.

A. Clamp Circuit

- Clamp drops rolls after they have been gripped.
- Clamp will not carry rolls up to the capacity of the clamp.
- Clamp arm won't function properly.
- Clamp arm drifts, towards swing arm, when in the horizontal position.

If one of these problems exists, see page 13-6.

B. Swing Circuit

- Swing function operates very slowly.
- Swing is in one direction only.
- Clamp drifts when in 'bilge' (horizontal) position.
- Clamp attempts to do two functions simultaneously.

If one of these problems exists, see page 13-9.

C. Rotation Circuit

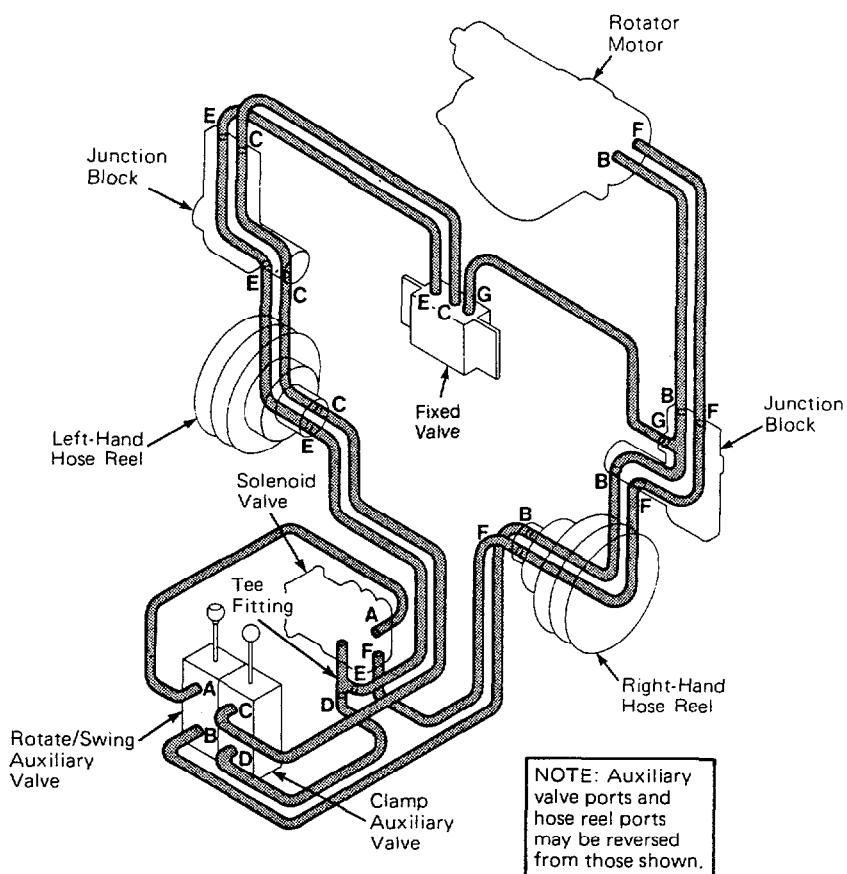
- Clamp swings when it is supposed to rotate.
- Clamp won't rotate.
- Clamp will not rotate rolls up to the capacity of the clamp.
- Clamp will rotate in one direction but not the other.

If one of these problems exists, see page 13-13.

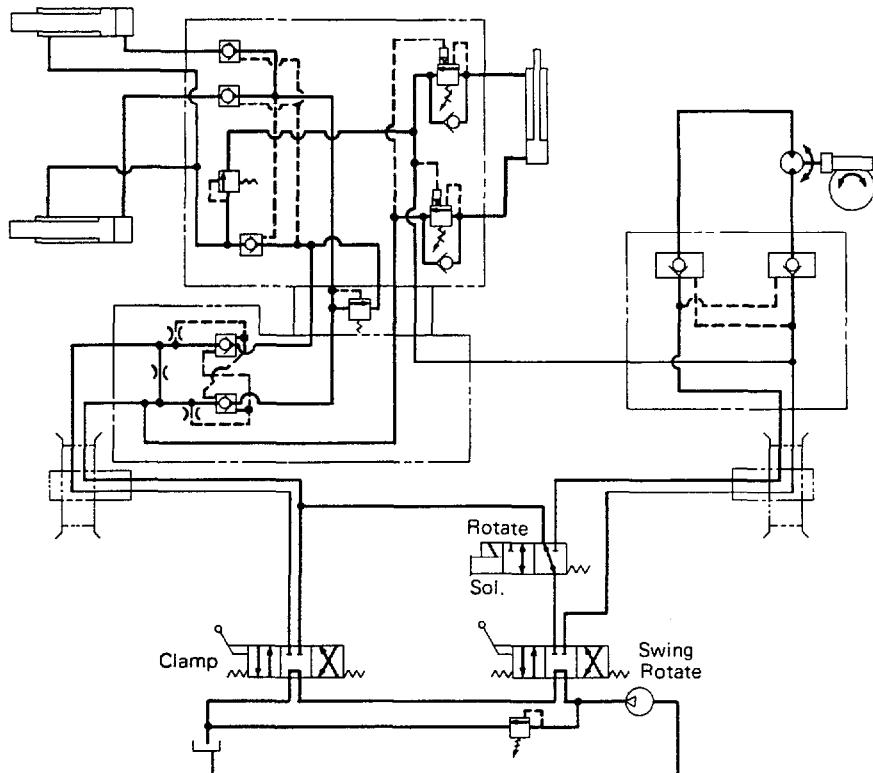
Section 2 Troubleshooting

2.2 Schematics

2.2-1 Plumbing



2.2-2 Hydraulic



Section 2 Troubleshooting

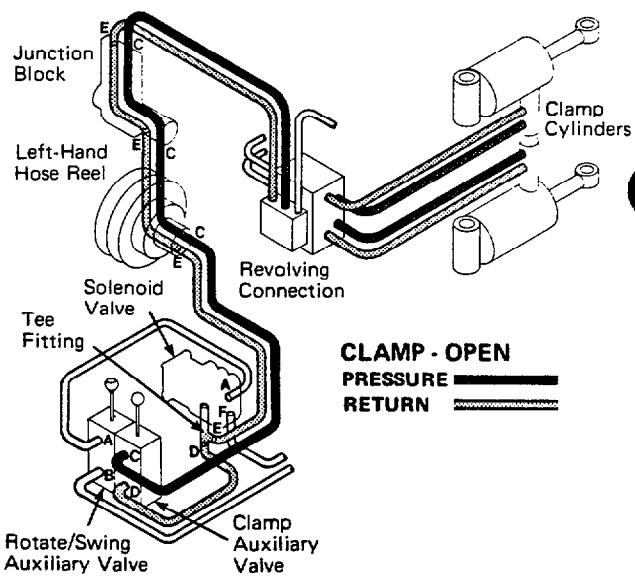
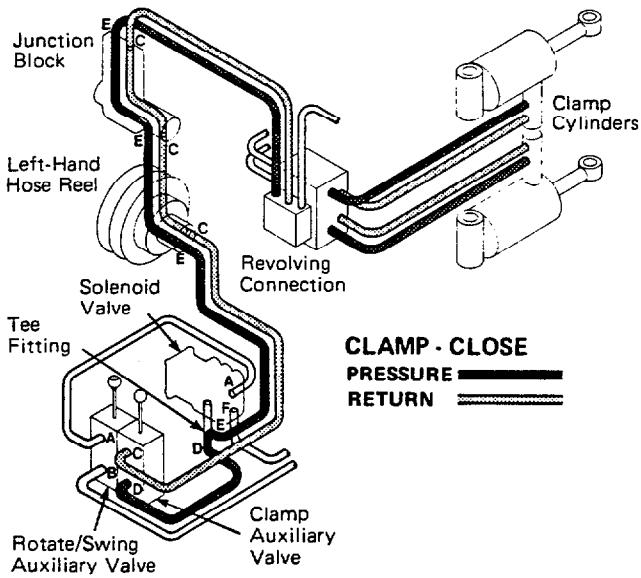
2.3 Clamp Circuit



WARNING: Before servicing any hydraulic component, open the arms 1-2", turn the truck off and relieve all pressure in the system by opening and closing all auxiliary valves. Be sure you complete this procedure with the solenoid valve activated.

After completing any service procedures, always test each function (swing, rotate, and clamp) through 5 complete cycles. First test the clamp empty, to bleed off any excess air trapped in the system. Then test each function with a load, to make sure the clamp operates correctly before returning it to the job.

2.3-1 Clamp Circuit Plumbing

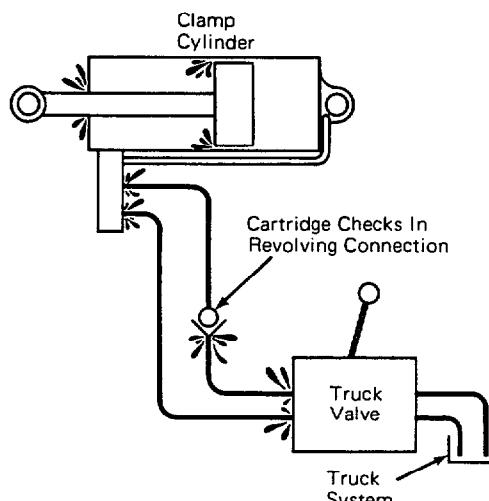


2.3-2 Clamp Circuit Troubleshooting

There are four potential problem areas that could affect clamping force.

- Insufficient hydraulic pressure.
- External leaks.
- Malfunctioning cartridge check valves.
- Worn or defective cylinder seals.

To isolate the problem area, complete the following check list in the exact sequence indicated.



Possible Leak Points

Section 2 Troubleshooting

2.3.2 Clamp Circuit Troubleshooting (Cont.)

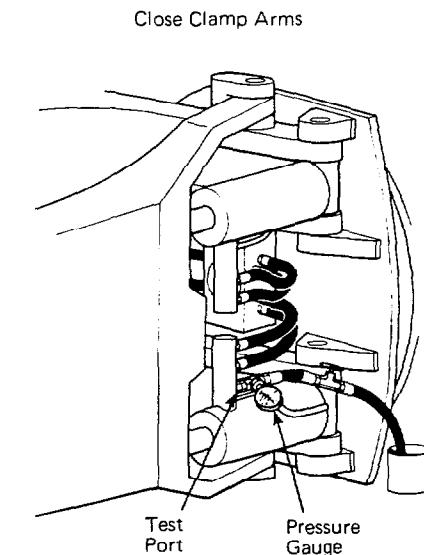
1. Pressure Test

- Open the arms 1-2".
- Install your pressure gauge on one of the 'clamp' cylinder test ports.
- Set up the pressure test described in paragraph 2.1-3. To perform this test, move the control handle to the CLAMP position. The initial reading should be the truck's system pressure (a 100 psi loss is OK).

If the gauge does not register the truck system pressure, check the pressure being delivered by the truck pump as outlined in your truck service manual. Adjust and repair as necessary. Following the adjustment recheck the pressure at the 'clamp' cylinder test port.

If a gradual pressure loss continues (after the 100 psi loss) this indicates a problem in the clamp components. Proceed with the troubleshooting checklist.

If the pressure reading is not within 100 psi of the truck system pressure, AND there is no gradual pressure loss, your problem may not be hydraulic, but may be related to the application of the clamp. In this case, call Cascade's Service Department at 800-547-5266 (toll-free), or in Oregon, 666-1511.



2. External Leaks

- Refer to the diagrams on the preceding page and check for all areas that could have external leaks.
- Repair as necessary and carefully operate the clamp with a load to determine if the problem has been solved.



WARNING: Stay clear of the load while testing, and do not raise the roll more than 3 inches off the floor.

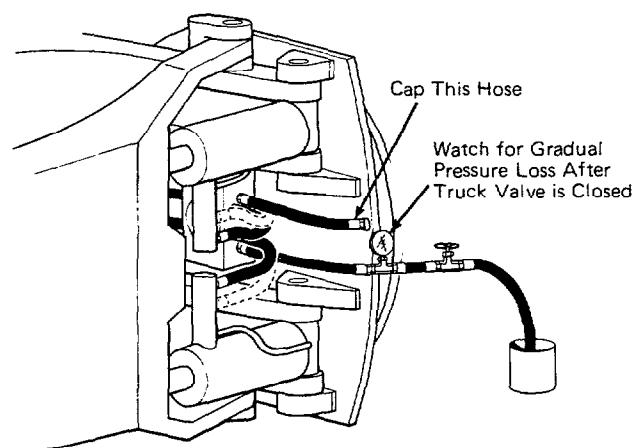
3. Cartridge Check Valve Test

- Open the arms 1-2".
- Relieve any pressure in the system by opening and closing the truck valves, then turn the truck off.
- Remove both of the inside hoses (pressure lines) from the clamp cylinders. Plug one hose with a No. 8 metal plug.
- Set up the pressure test described in paragraph 2.1-3. To perform the test, move the control handle to the CLAMP position. The initial reading should be the truck's system pressure (a 100 psi loss is OK).

If there is a gradual pressure loss (after the 100 psi loss), once the truck valve is closed, one of the following problems is responsible:

- a. Check valve cartridge is defective.
- b. Cartridge seals are severely damaged.
- c. Revolving valve body is damaged internally.

- Repeat this test on the capped hose, to check the other cartridge and cartridge seals.
- Replace cartridge, cartridge seals, or valve body if necessary.



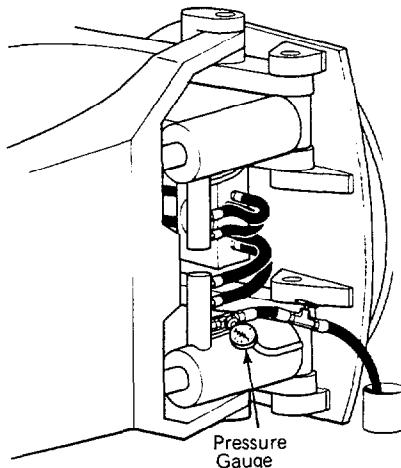
Section 2 Troubleshooting

2.3.2 Clamp Circuit Troubleshooting (Cont.)

4. Cylinder High Pressure Seal Test

IMPORTANT: In order to accurately check the cylinder seals, you must have completed the prior steps in this check list.

- Open the arms 1-2".
- Install a pressure gauge in the test port on one of the cylinders.
- Set up the pressure test described in paragraph 2.1-3. To perform the test, move the control handle to the CLAMP POSITION. The initial reading should be the truck's system pressure (a 100 psi loss is OK).



If there is a gradual pressure loss (after the 100 psi loss), once the truck valve is closed, replace the cylinder seals (see page 13-21).

- Repeat the test on the other cylinder test port.
- Carefully operate the clamp with a maximum load (in the vertical position) to determine if the problem has been solved.



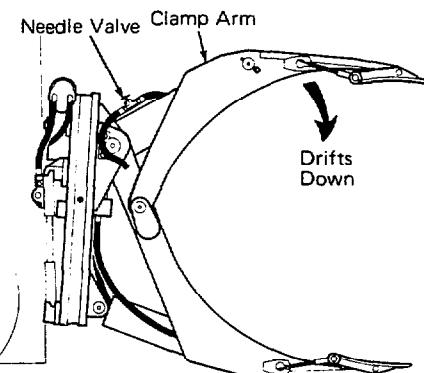
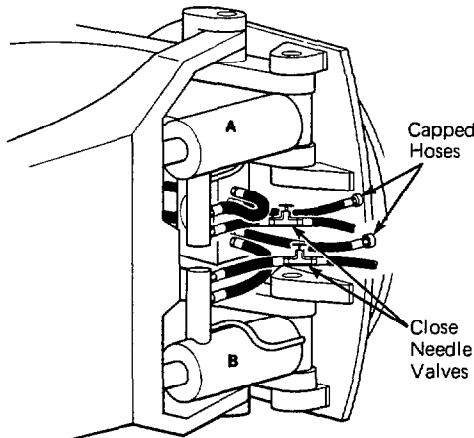
WARNING: Stay clear of the load while testing, and do not raise the roll more than 3 inches off the floor.

5. Cylinder Low Pressure Seal Test

- Open the arms 1-2".
- Remove both of the outside hoses (return lines) from the clamp cylinders. Plug the hoses with No. 6 metal plugs.
- Install a needle valve (attached to a length of hose) into the open port on each clamp cylinder. Close the needle valve tightly.
- Rotate the clamp to the horizontal position with the clamp arm on top.
If the clamp arm drifts down, then both cylinders have damaged seals.
- If no drift occurs, one of the cylinders MAY have defective seals. Perform the following to determine if one of the clamp cylinders needs new seals:
 - Slightly open the needle valve on cylinder A.
If the clamp arm drifts down, then cylinder B has defective seals.
 - If no drift occurs then cylinder B seals are OK.
 - Repeat this needle valve test on cylinder B.
If the clamp arm drifts down, then cylinder A has defective seals.
 - If no drift occurs then cylinder A seals are OK.
- Carefully operate the clamp with a maximum load (in the vertical position) to determine if the problem has been solved.



WARNING: Stay clear of the load while testing, and do not raise the roll more than 3 inches off the floor.



6.

If you have carefully and accurately completed this check list, and you still have not solved the problem, DO NOT PROCEED! Please call one of our service representatives at 800-547-5266 (toll free), or in Oregon, 666-1511. Our Service Department is open from 10:00 a.m. to 8:00 p.m. Eastern Time.

**Call Cascade's Service
Department at 800-547-5266
In Oregon 666-1511**

2.4

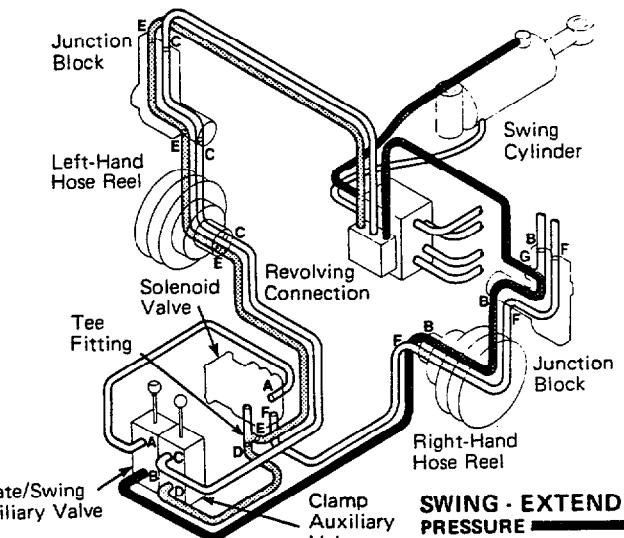
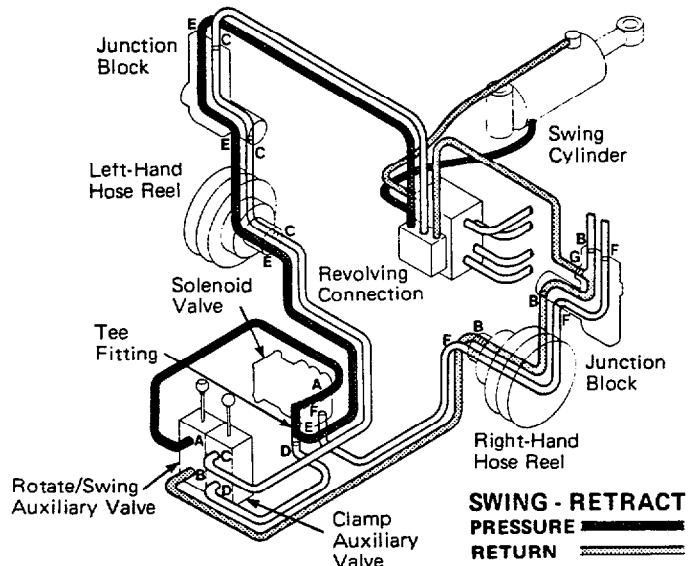
Swing Circuit



WARNING: Before servicing any hydraulic component, open the arms 1-2", turn the truck off and relieve all pressure in the system by opening and closing all auxiliary valves. Be sure you complete this procedure with the solenoid valve activated.

After completing any service procedures, always test each function (swing, rotate, and clamp) through 5 complete cycles. First test the clamp empty, to bleed off any excess air trapped in the system. Then test each function with a load, to make sure the clamp operates correctly before returning it to the job.

2.4-1 Swing Circuit Plumbing



2.4-2 Swing Circuit Troubleshooting

If the swing function is not operating properly, you should first recheck the plumbing diagram on page 13-5 to be sure the attachment is correctly plumbed to the truck.

You should also check for severe oil leakage in the following areas:

- Hose reels
- Junction blocks
- Around swing cylinder rod
- Revolving connection
- Hose fittings

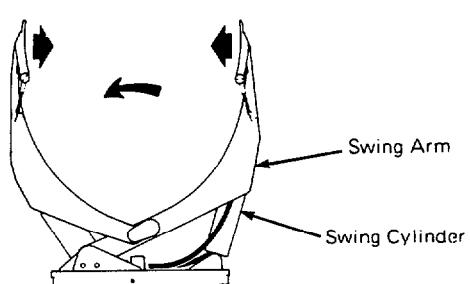
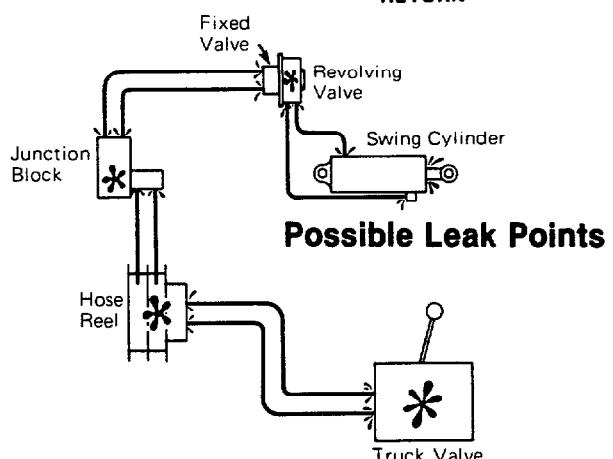
1. PROBLEM: Clamp attempts to swing and close at the same time.

PROBABLE CAUSES

- Internal leak in the truck auxiliary valve for the 'clamp' function.

NOTE: Please note that the leak is in the 'clamp' auxiliary valve . . . not the 'swing' auxiliary valve.

- Malfunctioning fixed valve.



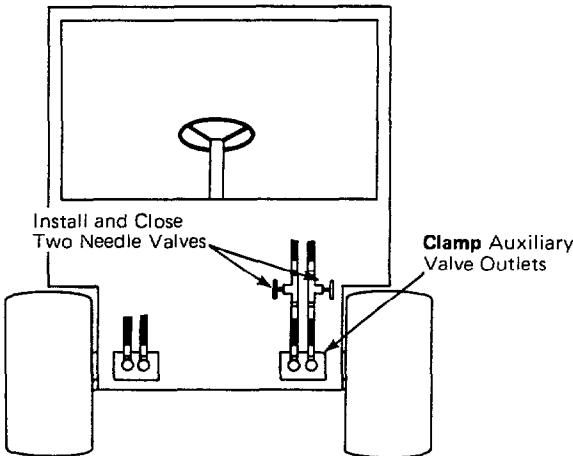
2.4.2 Swing Circuit Troubleshooting (Cont.)

TEST

- Install a needle valve in each clamp line at the auxiliary valve outlets.
- Close both valves tightly.
- Operate the clamp.

IF the needle valves eliminate the problem, then your truck clamp auxiliary valve needs repair.

IF the needle valves do NOT eliminate the problem, replace the fixed valve body (see page 13-25).



2. PROBLEM:

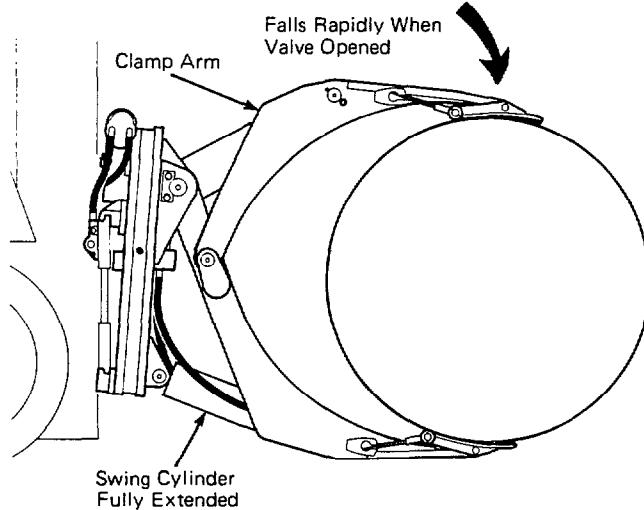
- Clamp in 'bilge' (horizontal) position
- Swing arm on bottom
- Swing cylinder completely extended
- Clamp 'falls' rapidly when swing control lever actuated to retract the swing arm

PROBABLE CAUSE

- Internal malfunction in revolving connection.

SOLUTION

- Replace revolving valve body (see page 13-25).



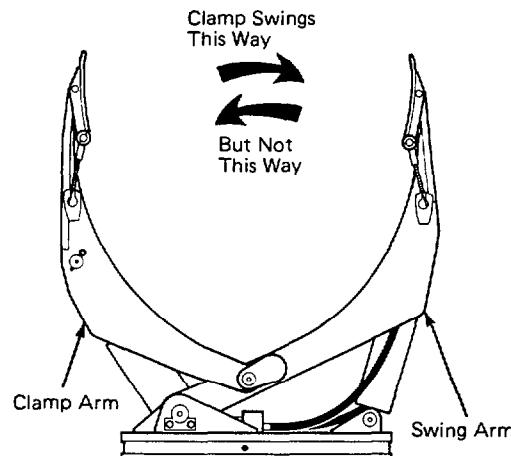
3. PROBLEM: Clamp swings in one direction only (swing cylinder retracts but will not extend).

PROBABLE CAUSE

- Internal malfunction in revolving valve body.

SOLUTION

- Replace revolving valve body (see page 13-25).



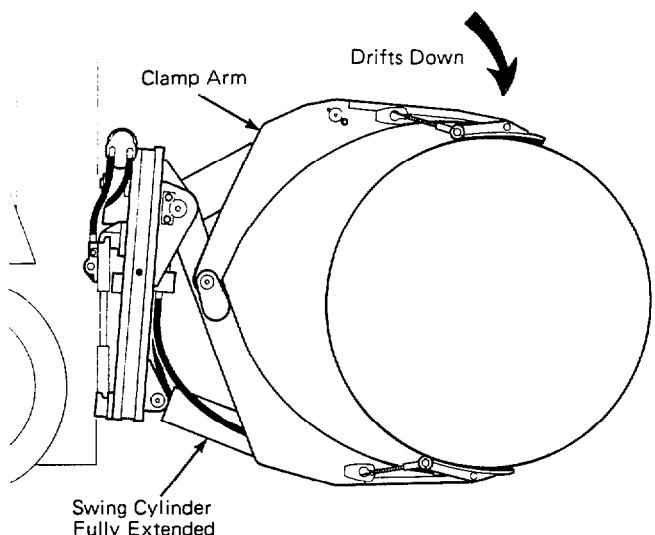
2.4.2 Swing Circuit Troubleshooting (Cont.)

4. PROBLEM:

- Clamp in 'bilge' (horizontal) position.
- Swing arm on bottom.
- Swing cylinder completely extended.
- Clamp drifts down, particularly when clamping a roll.

PROBABLE CAUSE

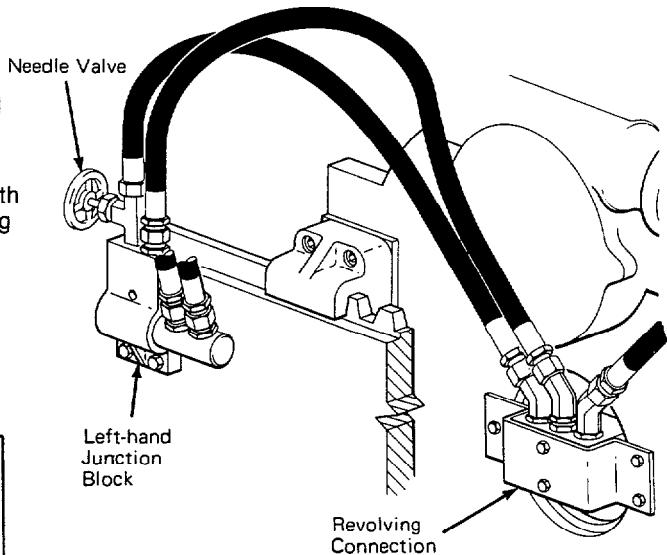
- Internal leak in truck auxiliary valve for the 'swing' function.

**TEST**

- Install a needle valve in the 'swing' line at the left hand junction block (as viewed from driver's seat).
- Open the needle valve.
- Clamp a roll. Rotate the clamp to the 'bilge' position with the swing arm on the bottom, and fully extend the swing cylinder.



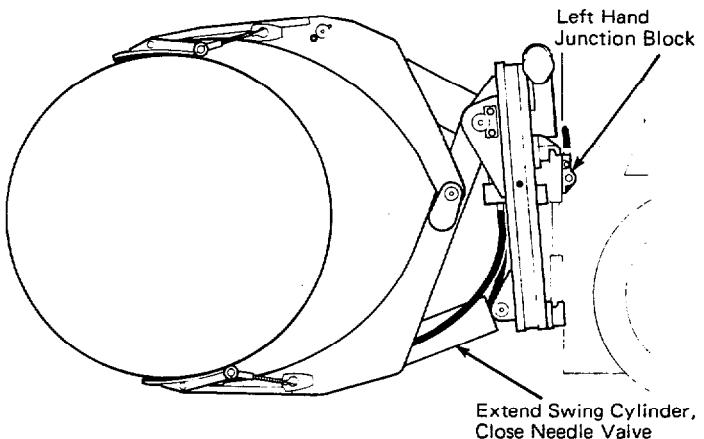
WARNING: Exercise extreme caution when clamping a roll and make sure there are no people in front of the clamp or near the sides of the clamp.



- Quickly close the needle valve and turn the truck off.

IF the needle valve eliminates the drift, make a note of this and call a Cascade service representative at 800-547-5266 (toll free), or in Oregon call 666-1511.

IF the needle valve does NOT eliminate the drift, make a note of this and call a Cascade service representative at 800-547-5266 (toll free), or in Oregon call 666-1511.



Section 2 Troubleshooting

2.42 Swing Circuit Troubleshooting (Cont.)

5. PROBLEM: Swing function operates very slowly when swinging roll.

NOTE: The swing function is intentionally designed to operate slowly. This problem should be considered only if there has been an appreciable reduction in speed over the normal operating speed.

PROBABLE CAUSE

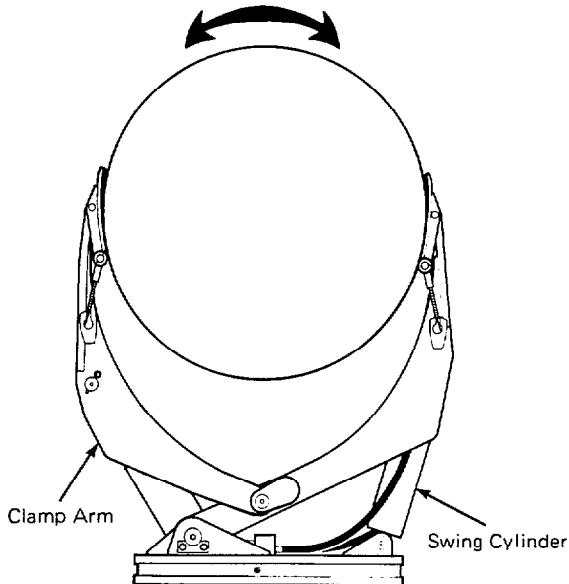
- Wrong size hoses were installed.
- Revolving valve is internally damaged.

SOLUTION

- Use No. 8 Hoses.
- Replace the revolving valve body.

6. If the problems listed in this section do not correspond to the problem you are experiencing, or if the procedures outlined have not solved your problem, DO NOT PROCEED! Call a Cascade service representative at 800-547-5266 (toll free), or in Oregon call 666-1511. Cascade's Service Department is open from 10:00 a.m. to 8:00 p.m., Eastern time.

Swing **Very Slowly**
When Swinging Roll



**Call Cascade's Service
Department at 800-547-5266
In Oregon 666-1511**

Section 2 Troubleshooting

2.5

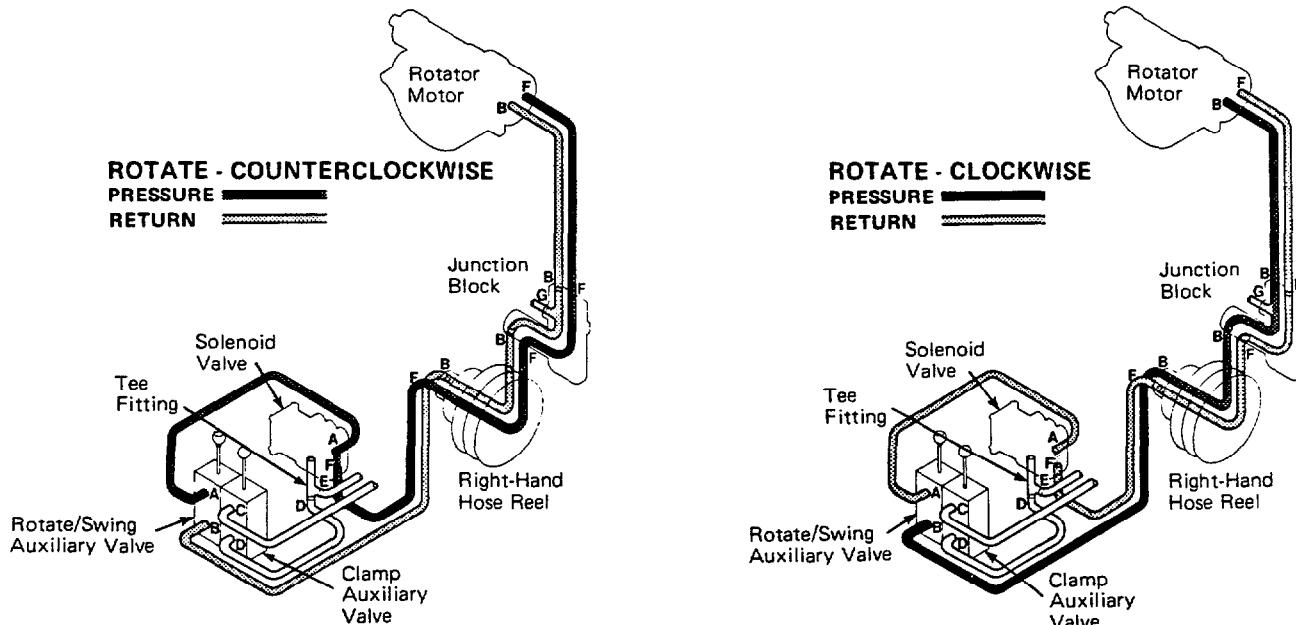
Rotate Circuit



WARNING: Before servicing any hydraulic component, open the arms 1-2", turn the truck off and relieve all pressure in the system by opening and closing all auxiliary valves. Be sure you complete this procedure with the solenoid valve activated.

After completing any service procedures, always test each function (swing, rotate, and clamp) through 5 complete cycles. First test the clamp empty, to bleed off any excess air trapped in the system. Then test each function with a load, to make sure the clamp operates correctly before returning it to the job.

2.5-1 Rotate Circuit Plumbing



2.5-2 Rotate Circuit Troubleshooting

There are four potential problems that could affect the rotation system.

- Clamp swings when it is supposed to rotate.
- Clamp does not rotate or swing when the ROTATE button is depressed and the valve is opened.
- Clamp will not rotate a roll up to the rated capacity of the clamp.
- Clamp will rotate in one direction but not in the other.

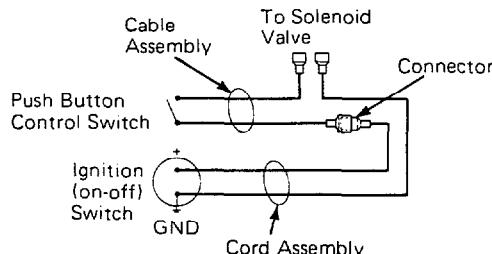
To isolate the specific cause of your problem, refer to the procedures outlined below.

1. **PROBLEM:** Clamp swings when it is supposed to rotate.

PROBABLE CAUSE:

- Short circuit in electrical system to solenoid.
- Solenoid not operating.

Note: Make sure the solenoid coil is the same voltage rating as the truck's system.



Section 2 Troubleshooting

2.5.2 Rotate Circuit Troubleshooting (Cont.)

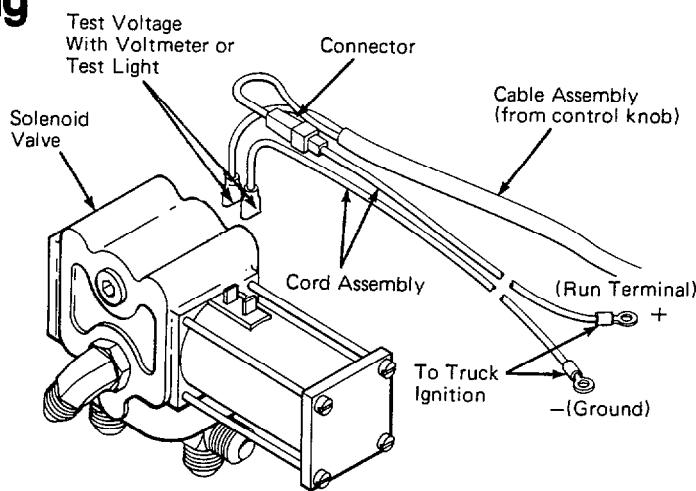
TEST: (Follow exact sequence)

for voltage at solenoid

- Check for loose connections in all electrical wiring, from the control button, to the truck's ignition, to the solenoid.
- Disconnect the electrical leads at the solenoid.
- Using a voltmeter or a test light, make sure there is electrical voltage at the electrical leads when the ROTATE button is depressed.

IF there is no voltage to the solenoid, begin troubleshooting the electrical circuit for short circuits (be sure to include the ROTATE switch in the control handle in your tests).

IF there is voltage to the solenoid when the ROTATE button is depressed, continue on with this checklist.

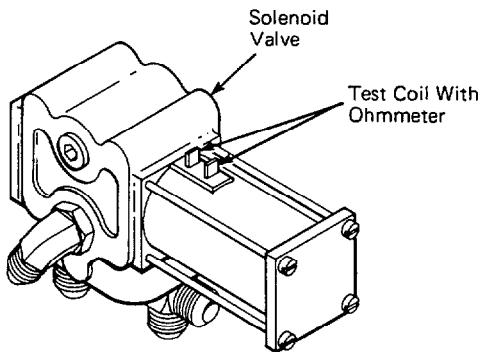


for coil continuity

- Using an ohmmeter, check the solenoid coil by placing a lead on each solenoid terminal.

IF there IS current through the ohmmeter, but the solenoid does not 'click' when the ROTATE button is depressed, the spool is jammed and the solenoid should be replaced.

IF there is no current through the ohmmeter, the coil is defective and should be replaced.



2. PROBLEM: Clamp does not rotate or swing when the ROTATE button is depressed and the truck valve is opened.

PROBABLE CAUSE:

- Mechanical malfunction in the Rotator Drive Group or the Rotator Bearing mechanism.

SOLUTION:

- Refer to page 13-28 for disassembly and inspection of the Rotator Drive Group and page 13-34 for the Rotator Bearing mechanism.

Section 2 Troubleshooting

2.5.2 Rotate Circuit Troubleshooting (Cont.)

3. PROBLEM: Clamp will not rotate a roll up to the rated capacity of the clamp.

PROBABLE CAUSES:

- Insufficient truck hydraulic pressure.
- Incorrect roll handling procedures.
- Excessive back pressure in truck hydraulic system.

TESTS:

- Check the pressure being delivered by the truck's hydraulic system at the 'rotate/swing' auxiliary valve ports. The pressure should initially be the truck's system pressure (a 100 p.s.i. loss is OK). If the pressure is not within this range, refer to your truck's service manual for adjustment. **Pressure must not exceed 2000 p.s.i.**
- Make sure the operator is gripping the roll as shown in the illustration. Gripping a roll, particularly a long roll, near the end, and then attempting to rotate it, requires a tremendous amount of torque . . . often times beyond the capacity of the clamp.
- 'T' a pressure gauge into each port on the hydraulic motor (do not use the needle valve/drain line components).
- Securely grip a roll that weighs close to the capacity of the clamp.
- Rotate the roll and note the pressure readings on the gauges during rotation.

IF the lower pressure reading exceeds 200 p.s.i., you have excessive back pressure in your supply circuit. Check for restrictions such as numerous fittings, hose sizes less than #8, clogged oil filter, etc.

IF the lower pressure does NOT exceed 200 p.s.i., and the truck pressure is within the specified range, the hydraulic motor needs repair (refer to page 13-31).

4. PROBLEM: Clamp will rotate in one direction but not in the other.

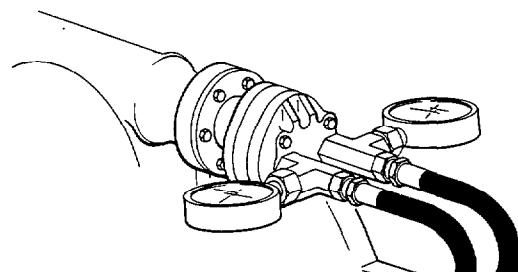
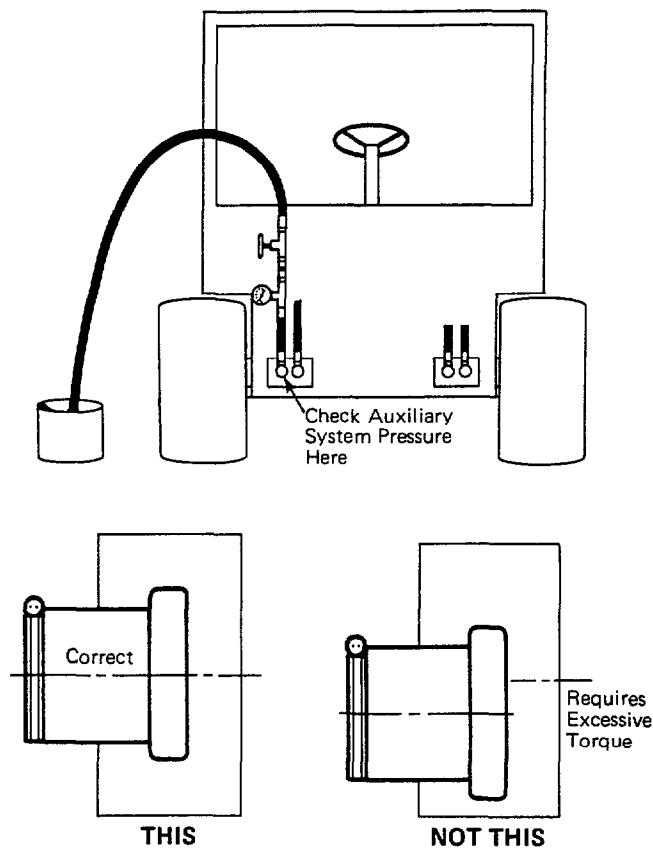
PROBABLE CAUSE:

- Right hand junction block pilot spool is jammed.

SOLUTION:

- Replace right hand junction block.

5. If the problems listed in this section do not correspond to the problem you are experiencing, or if the procedures outlined have not solved your problem, DO NOT PROCEED! Call a Cascade service representative at 800-547-5266 (toll free), or in Oregon call 666-1511. Cascade's Service Department is open from 10:00 a.m. to 8:00 p.m., Eastern time.



**Call Cascade's Service
Department at 800-547-5266
In Oregon 666-1511**

Section 3 Service

3.1 Clamp Removal

There are two ways to remove the 70E Roll Clamp from the truck.

A is to be used if you are servicing any of the following:

- Drive Group
- Revolving Connection
- Baseplate
- Ring Gear & Bearing Assembly
- Frame

B is to be used for servicing all remaining components.

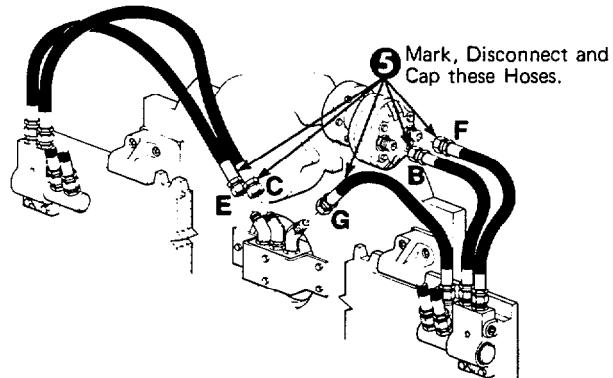
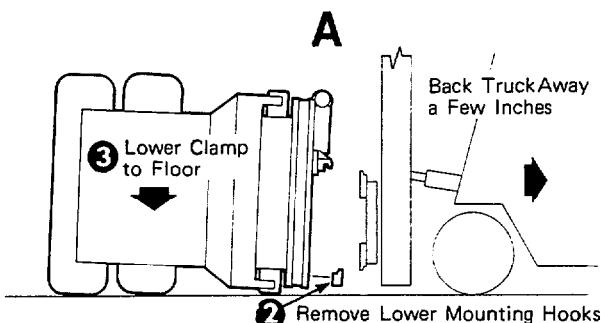
3.1-1

A

- ① Open the clamp arm fully and the swing arm to within 3" of fully extended.
- ② Remove the lower mounting hooks.

For Reassembly Lube Torque to:

| | |
|--------------------|---|
| Class III, 4° & 0° | 85-90 ft.-lb. |
| Class IV, 4° & 0° | Extension: 68-72 ft.-lb. Hook: 85-90 ft.-lb. |



- ③ Lower the mast until the clamp is on the floor.
- ④ Lower the carriage enough to clear the upper mounting hooks and back away a few inches.
- ⑤ Disconnect and cap the hoses at ports B, C, E, G, and F. **IMPORTANT:** Mark all the hoses with their proper port identification for ease in reconnecting.
- ⑥ For reinstallation, reverse the above procedures.

3.1-2

B

- ① Position the clamp with the swing arm on the bottom.
- ② Secure a hoist chain to each side of the clamp, making sure the chains will support the weight of the clamp.

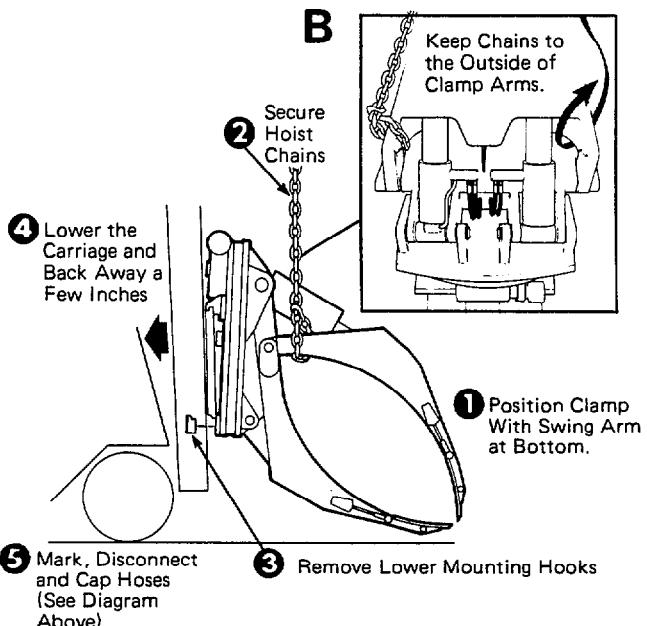


WARNING: Make sure your overhead crane has a rated lifting capacity of at least 3000 lbs.

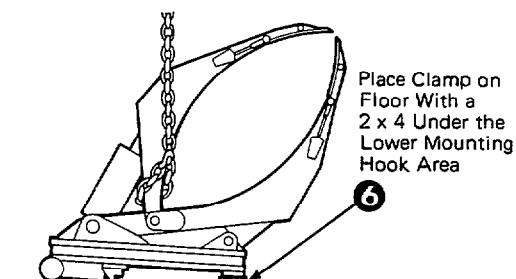
- ③ Remove the lower mounting hooks.

For Reassembly Lube Torque to:

| | |
|--------------------|---|
| Class III, 4° & 0° | 85-90 ft.-lb. |
| Class IV, 4° & 0° | Extension: 68-72 ft.-lb. Hook: 85-90 ft.-lb. |



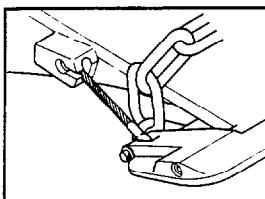
- ④ Lower the truck carriage and back away from the clamp a few inches.
- ⑤ Disconnect and cap the hoses at ports B, C, E, G, and F. **IMPORTANT:** Mark all the hoses with their proper port identification for ease in reconnecting.
- ⑥ Lower the clamp until the frame rests on the floor. Place a 2 x 4 under the lower mounting hook area.
- ⑦ For reinstallation, reverse the above procedures.



3.2

Clamp Arm Removal

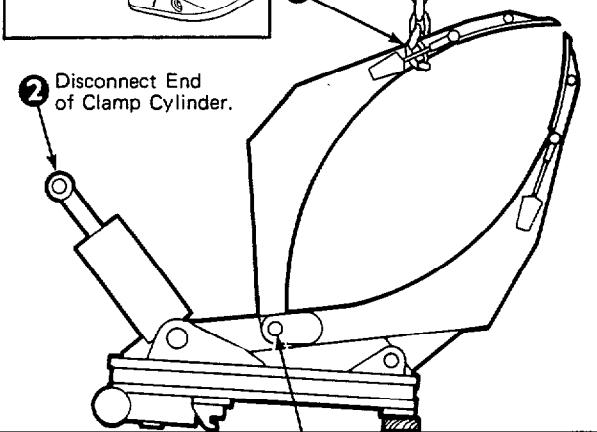
- 1 Set the attachment on the floor following procedure B on page 13-16.
- 2 Disconnect the rod end of both clamp cylinders.
- 3 Secure a hoist chain around the clamp arm.



Secure a Hoist Chain around Clamp Arm.

3

- 2 Disconnect End of Clamp Cylinder.



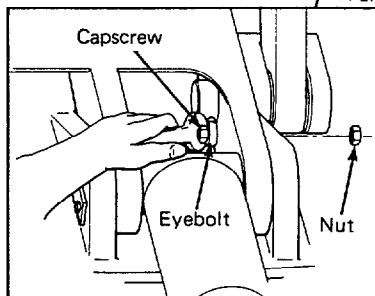
- 4 Remove the capscrew, nut, and eyebolt. Note the quantity and location of the washers before removing the pins. Make sure the same number of washers are replaced when reinstalling the pins.

4 Remove Capscrew, Nut, and Eyebolt. See Caution in Paragraph 4.



WARNING: Make sure your overhead crane has a rated lifting capacity of at least 1000 lbs.

- 5 Remove the pins and lift off the clamp arm.



Capscrew

Eyebolt

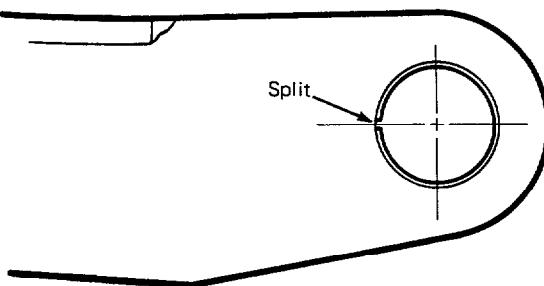
Nut

3.2-1 Bushing Replacement

NOTE: The bushings have a special grey coating on the inside surface. Be careful not to scratch or mar this surface when installing the bushing or inserting a pivot pin.

- 1 Drive the old bushing out with a bushing driver of same diameter. Do not gouge the bore surface of the arm.
- 2 Install the new bushing with a bushing driver. Drive it in flush.

Install Bushing with Split Located as Shown.

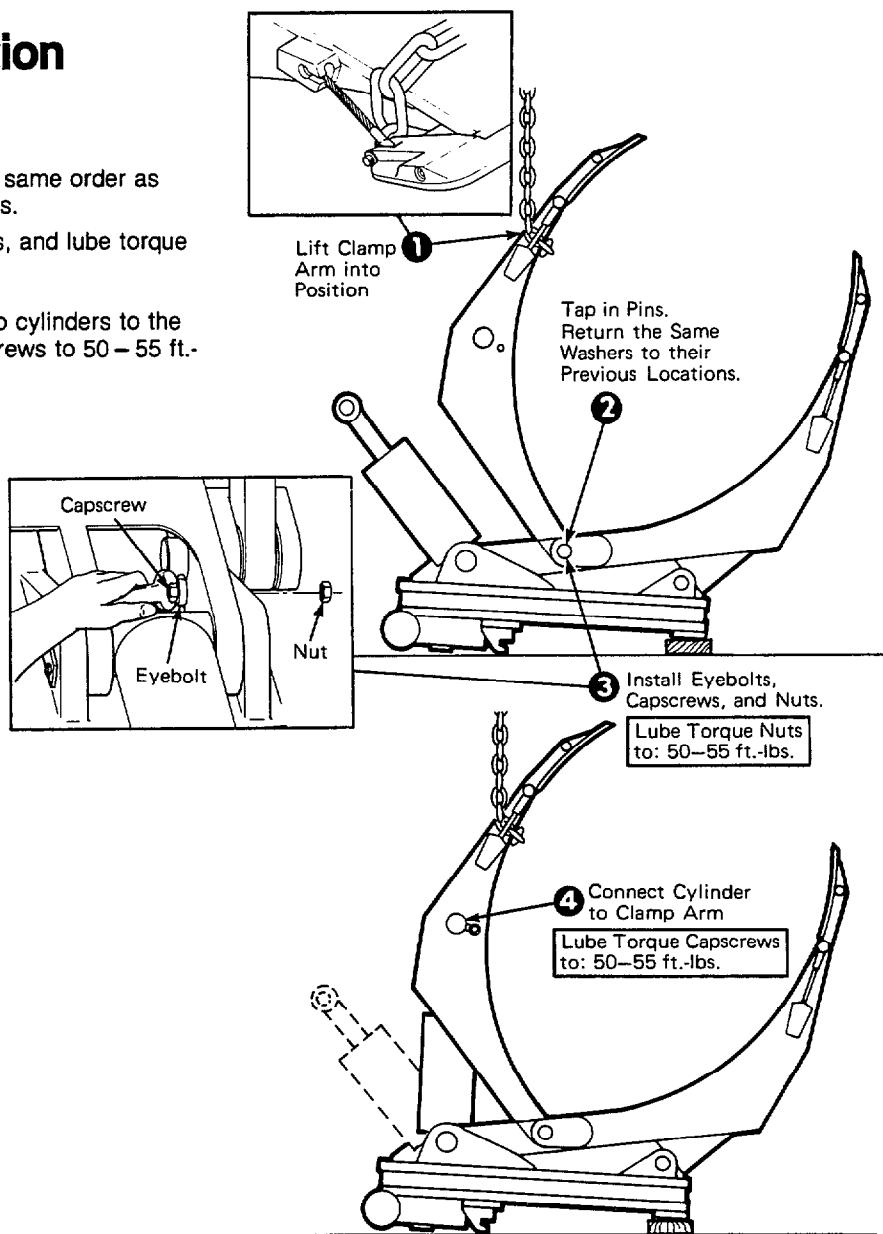


Split

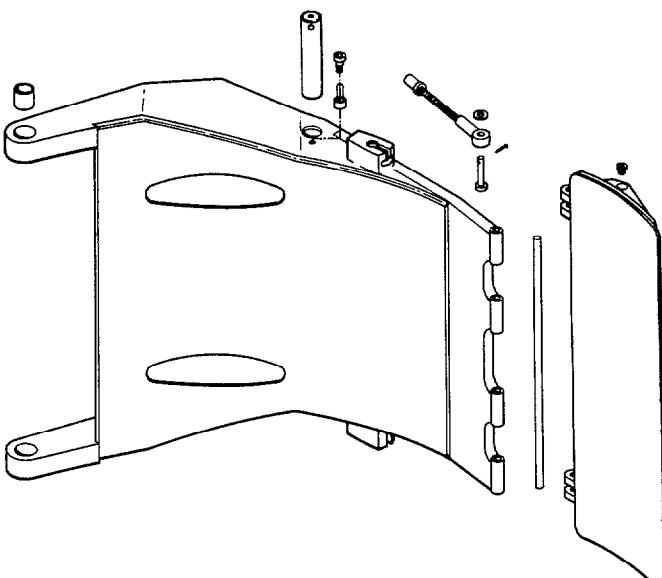
Section 3 Service

3.22 Clamp Arm Installation

- ① Lift clamp arm into position.
- ② Reinstall the same washers in the same order as they were removed. Tap in the pins.
- ③ Install the eyebolts and capscrews, and lube torque the nut to 50 – 55 ft.-lbs.
- ④ Connect the rod end of both clamp cylinders to the clamp arm, lube torque the capscrews to 50 – 55 ft.-lbs.



3.23 Clamp Arm Assembly



Section 3 Service

3.3

Swing Arm Removal

- 1 Set the attachment on the floor following procedure B on page 13-16.
- 2 Remove the clamp arm first (see page 13-17).
- 3 Attach a hoist chain to the swing arm as shown.
- 4 Remove the pin from the head end of the swing cylinder.
- 5 Lift the arm 6 inches using the hoist chain.
- 6 Mark the hoses with the port callouts and disconnect and cap the hoses at the revolving connection.
- 7 Note the quantity and location of washers before removing the pin. Remove the pin retainer. Screw an eyebolt into the pin, remove the pin.

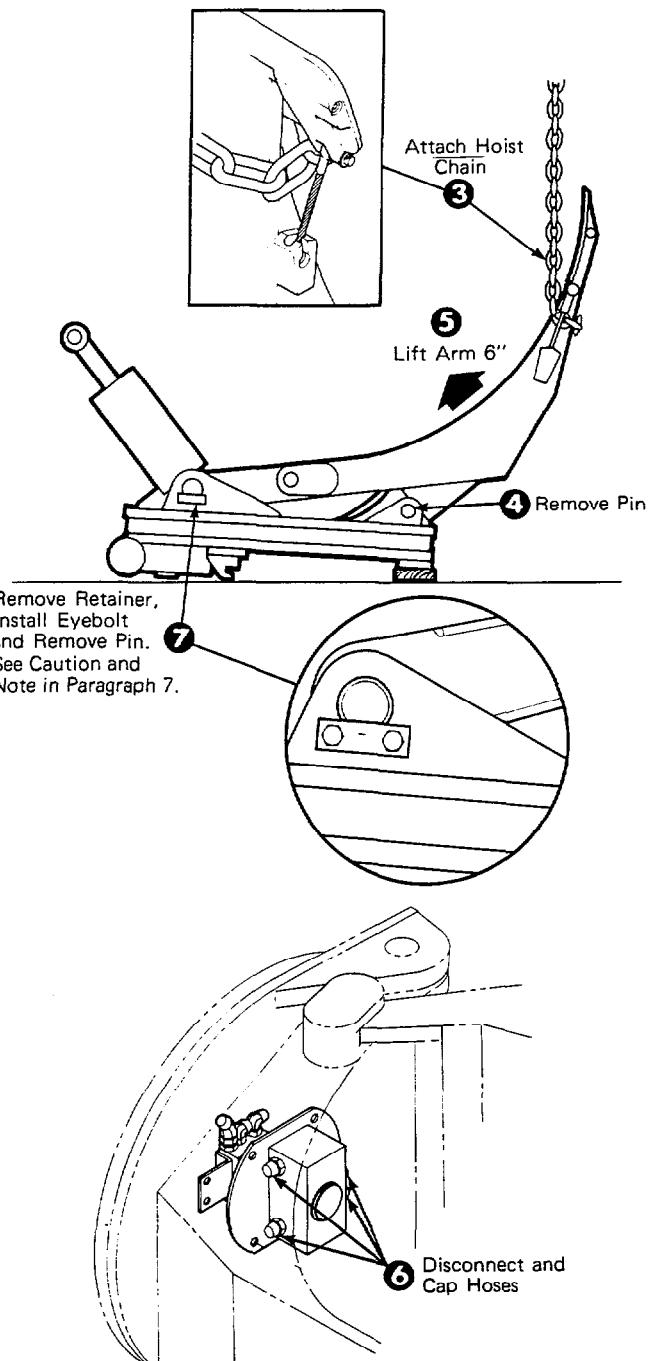


WARNING: Keep hands clear of the swing arm pivot area after removing the pins.

NOTE: Keep track of how many washers were with each pin. They must be replaced exactly where they came from.



WARNING: Make sure your overhead crane has a rated lifting capacity of at least 1000 lbs.

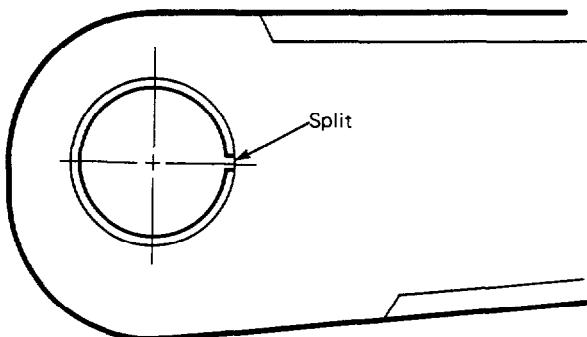


3.3-1 Bushing Replacement

NOTE: The bushings have a special grey coating on the inside surface. Be careful not to scratch or mar this surface when installing the bushing or inserting a pivot pin.

- 1 Drive the old bushing out with a bushing driver of same diameter. Do not gouge the bore surface of the arm.
- 2 Install the new bushing with a bushing driver. Drive it in flush.

Install Bushing with Split Located as Shown.



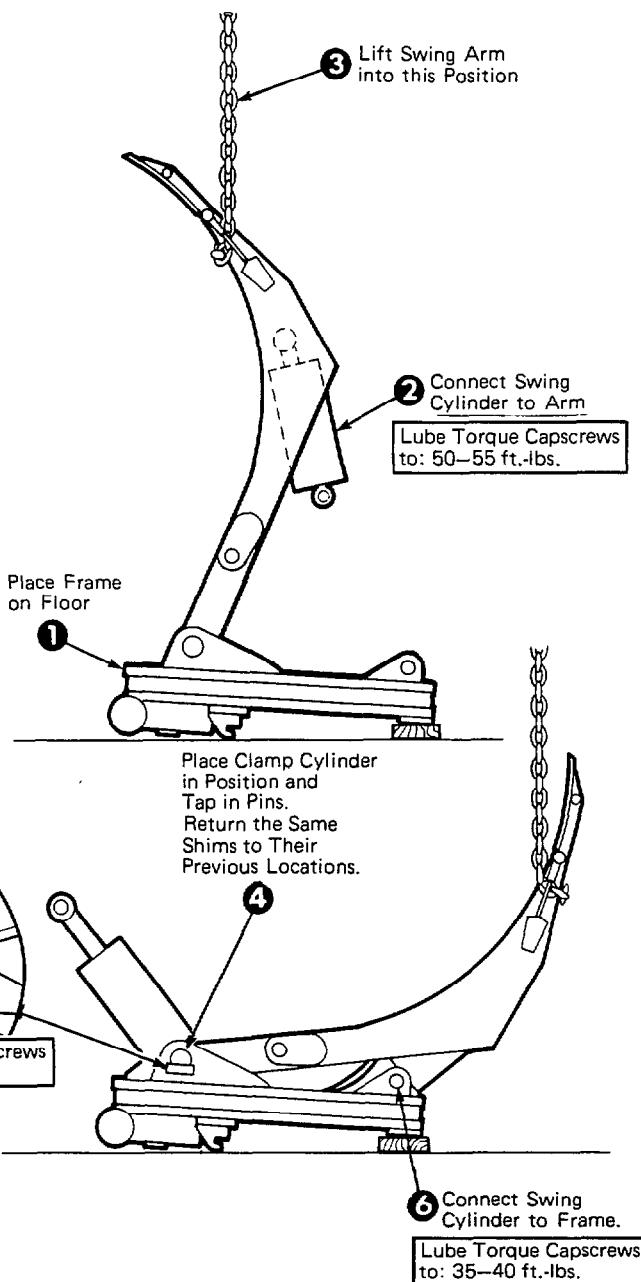
Section 3 Service

3.3-2 Swing Arm Installation

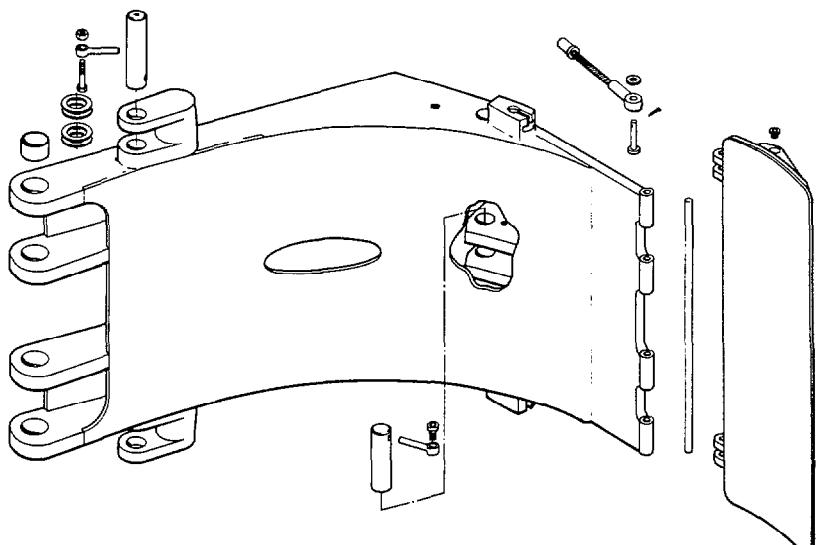
- ① Place the frame on the floor as shown.
- ② Connect the rod end of the swing cylinder to the swing arm, lube torque capscrews to 50 – 55 ft.-lbs.
- ③ Lift the swing arm into the position shown.

NOTE: Center the swing arm on the frame and make sure the swing arm is stable prior to tapping in the pin.

- ④ Place the clamp cylinders into position.
NOTE: Add enough shims to make the arm fit snug against the frame, then tap the pins into place.
- ⑤ Install the retainer, and lube torque the capscrews to 35 – 40 ft.-lbs.
- ⑥ Lower the swing arm to within 3" of the frame. Connect the base end of the cylinder to the frame. Lube torque the capscrews to 35 – 40 ft.-lbs.
- ⑦ Reconnect the swing cylinder hoses to the ports on the revolving connection.



3.3-3 Swing Arm Assembly



3.4

Cylinder General Procedures

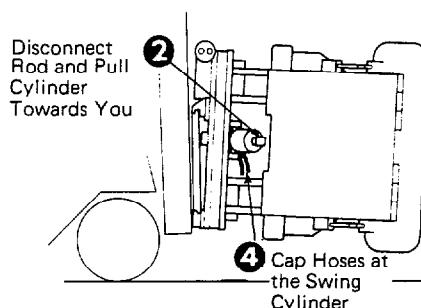
3.4.1 To Service Cylinder(s) on the Clamp

- ① Extend the swing arm fully to service the swing cylinder, or extend the clamp arm fully to service the clamp cylinders.
- ② Disconnect the rod end of the cylinder and pull the cylinder towards you.
- ③ Hydraulically retract the cylinder rod.



WARNING: Before removing any hoses, first relieve any pressure in the hoses by turning the truck off and opening and closing the truck auxiliary valves.

- ④ Remove and cap all hoses at the cylinder.

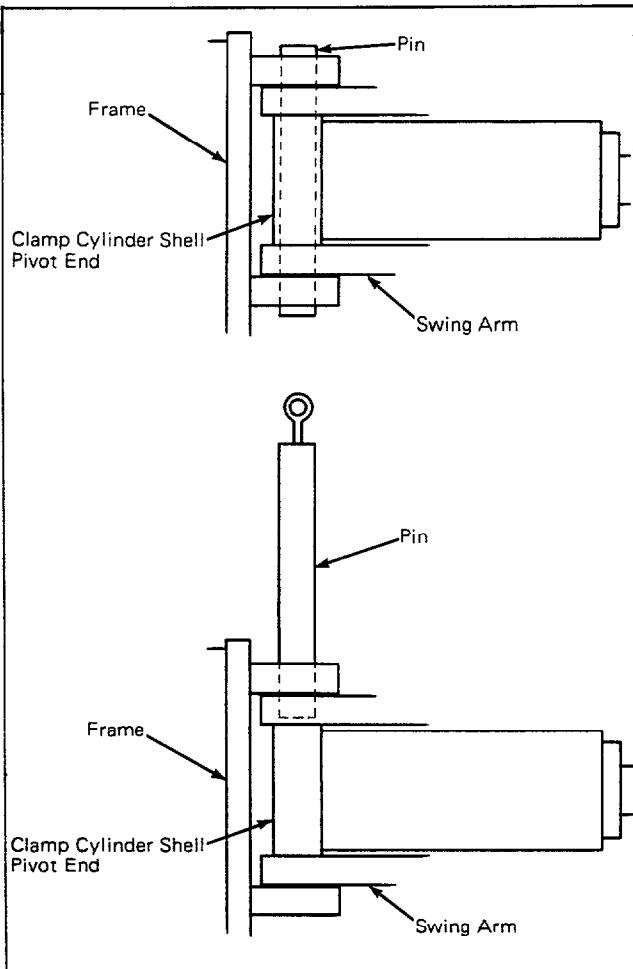


3.4.2 If Cylinder was Removed from the Clamp

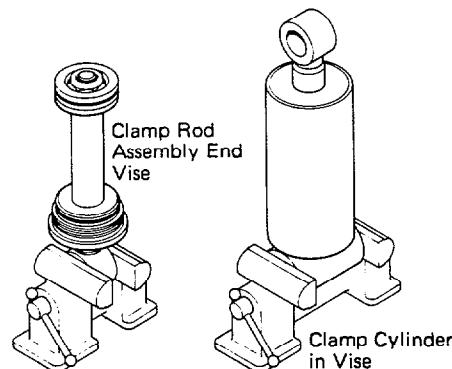
NOTE: Cylinders can be removed during clamp arm and swing arm removal OR to remove a clamp cylinder, pull out the pin as shown.



WARNING: DO NOT PULL THE PIN COMPLETELY OUT. When removing the swing cylinder make sure the swing arm is restrained by a hoist.



- ① Clamp the cylinder shell base end in a soft-jawed vise. Do not clamp the cylinder shell in a vise.



Section 3 Service

3.4.3 General Procedures

Disassembly

- Use a spanner wrench to remove the cylinder retainers. The illustration shows the two types needed to work on 70E cylinders.
- Clamp the rod assembly pivot end in a soft-jawed vise. Do not clamp the rod shaft in a vise.
- To remove the piston or retainer seal, place the piston or retainer in a soft-jawed vise and pry the seal up with a very blunt screwdriver. Cut the seal to remove it. Do not scratch the seal groove.



Pin Type Spanner Wrench



Claw Type Spanner Wrench

Inspection

- Inspect the rod, piston, and retainer for nicks or burrs. If deeply gouged then replace the part. Otherwise remove minor nicks and burrs with an emery cloth.
NOTE: Minor nicks are those that will not cause a bypass of oil when the cylinder is operating.
- Inspect the inside of the cylinder shell and remove any minor nicks or burrs (see note above) with a butterfly. Replace the cylinder shell if it is deeply gouged.
- Inspect the outer shell for any deformities which could weaken the shell's performance when under pressure. Replace if necessary.



Remove Seal from
Piston, **Do Not**
Scratch the Groove.



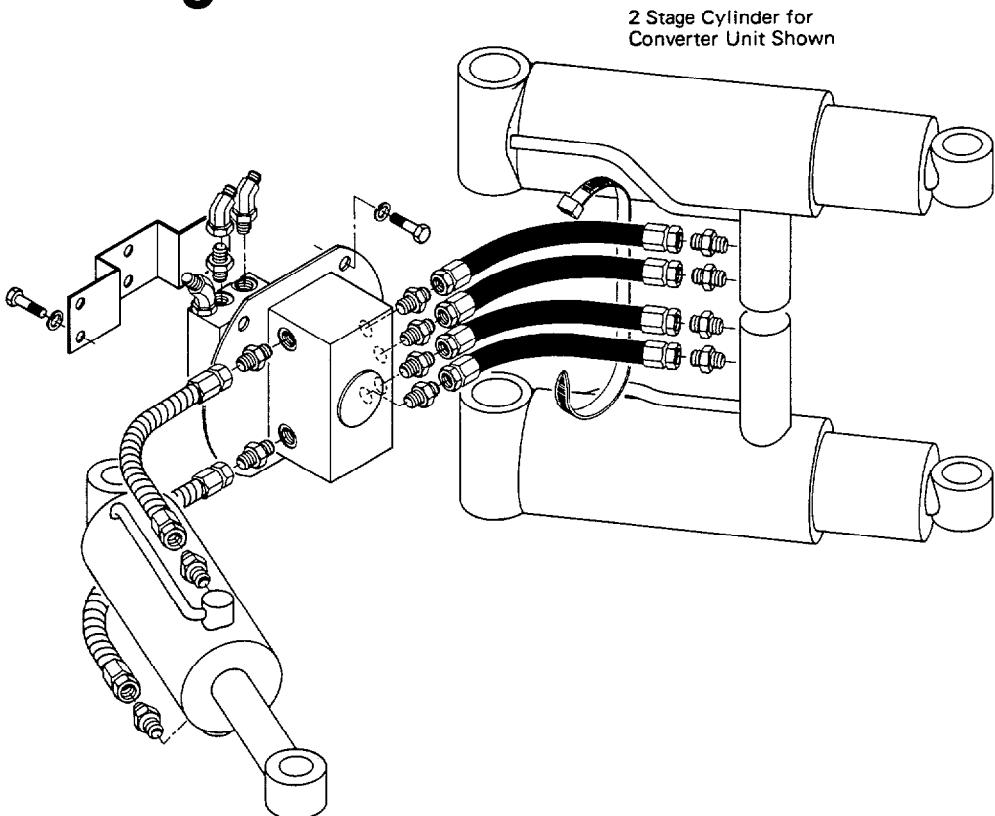
Install New Seal
as Shown.

Assembly

- Lubricate all new seals with STP before installing.
- To install the new seal in the piston or retainer, hook one side of the seal in the groove and push it over the piston or retainer.
NOTE: Polishing the chamfer angle will let the seal slide onto the groove much easier.
- Note the direction of the U-Cup seals. If installed backwards the seals will not work properly. Refer to the specific instructions for the cylinder you are servicing. See page 13-23 or 13-24.
- Always reassemble the rod assembly by sliding the retainer on first, and then the piston. Install and torque the retaining nut before sliding the rod assembly back into the shell.

Section 3 Service

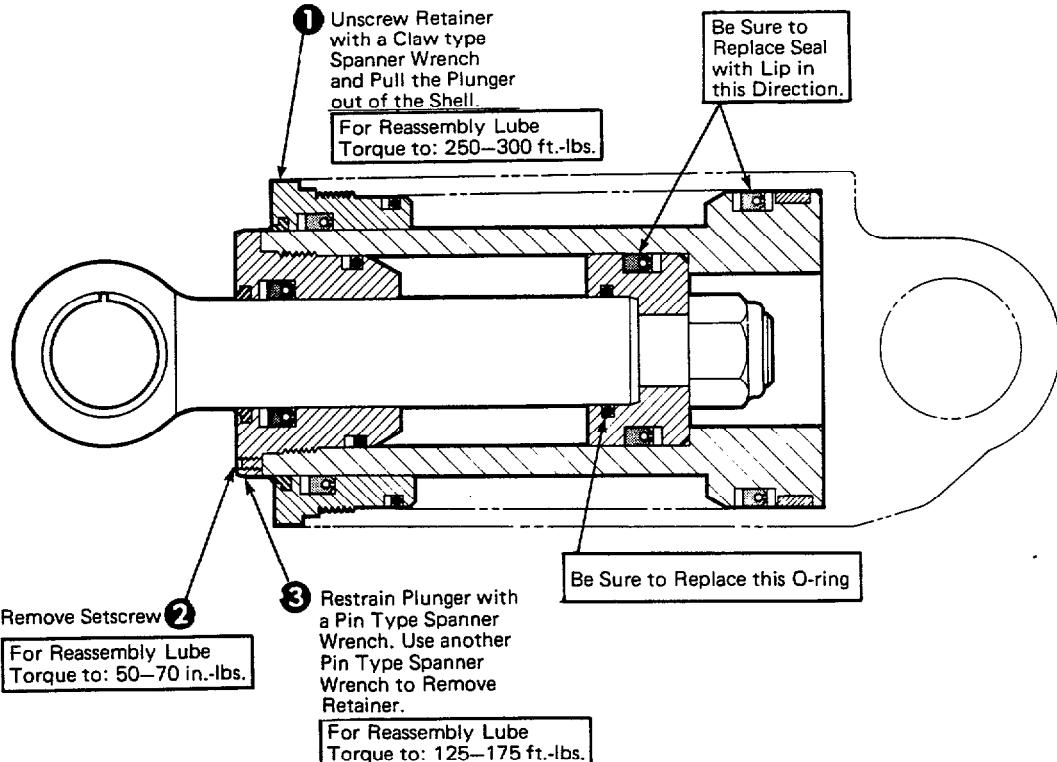
3.4-3 Plumbing



3.4-4 Two-Stage Clamp Cylinder Service

Read the Disassembly procedures, page 13-22, first.

- ① Use a claw type spanner wrench to remove the retainer. Pull the plunger assembly out of the cylinder shell.
- ② Remove the setscrew.
- ③ Restrain the plunger with a pin type spanner wrench and use another pin type spanner wrench to remove the retainer.
- ④ Pull the rod assembly out of the plunger.
- ⑤ See the Disassembly, Inspection, and Assembly techniques in the General Procedures on page 13-22.



Section 3 Service

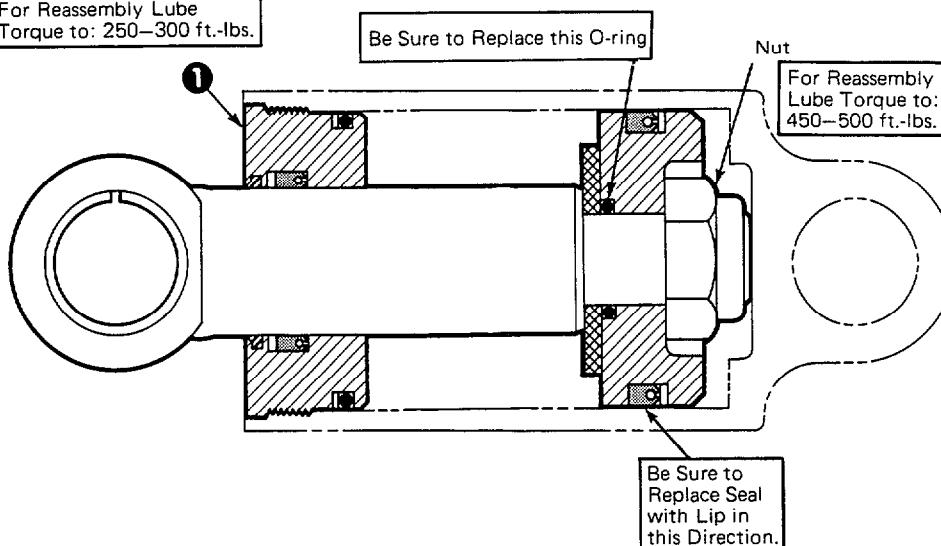
3.4-5 Swing Cylinder and Single-Stage Clamp Cylinder Service

1 Remove the retainer; use a claw type spanner wrench on the clamp cylinder; use a pin type spanner wrench on the swing cylinder.

Unscrew Retainer
CLAMP CYLINDER: Use a Claw Type Spanner Wrench
SWING CYLINDER: Use a Pin Type Spanner Wrench
Remove Rod Assembly.

2 Pull the rod assembly out of the shell.

3 See the Disassembly, Inspection, and Assembly techniques in the General Procedures on page 13-22.



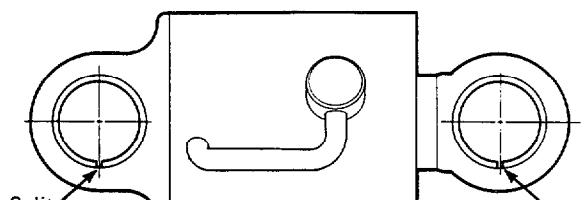
3.4-6 Bushing Replacement

NOTE: The bushings have a special grey coating on the inside surface. Be careful not to scratch or mar this surface when installing the bushing or inserting a pivot pin.

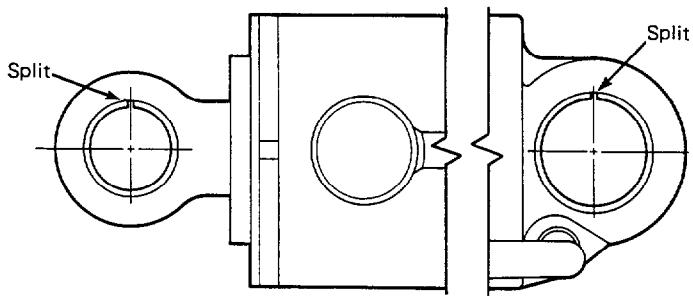
1 When replacing bushings in cylinders, drive each old bushing out from the opposite side. Do not drive both bushings with spacer out from the same side. Drive the old bushing out with a bushing driver of same diameter. Do not gouge the bore surface of the cylinder.

2 Drive the new bushing in flush, turn the cylinder over, CLAMP CYLINDER Single Stage and Two Stage

SWING CYLINDER



Install Bushings with Split Located as Shown.

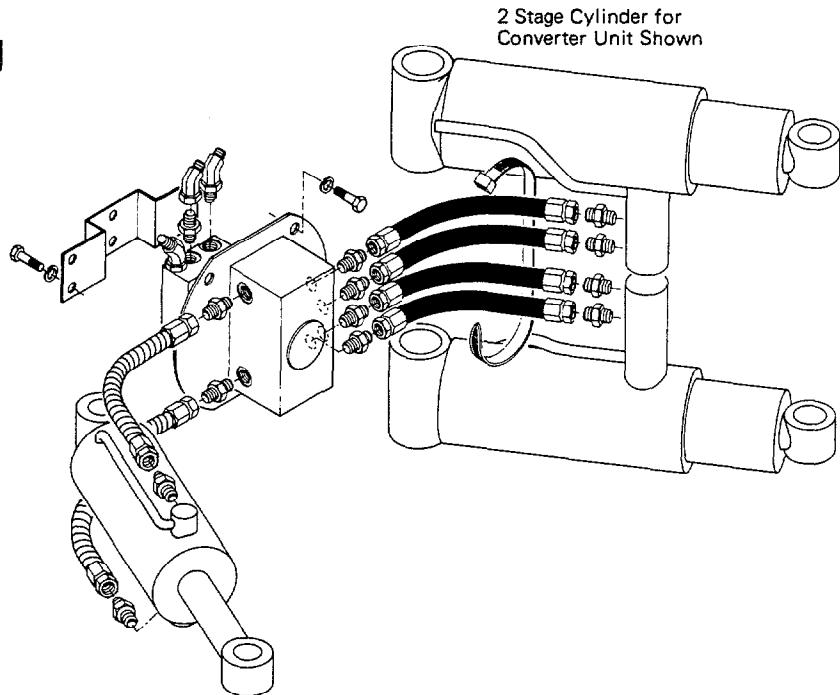


Install Bushings with Split Located as Shown

Section 3 Service

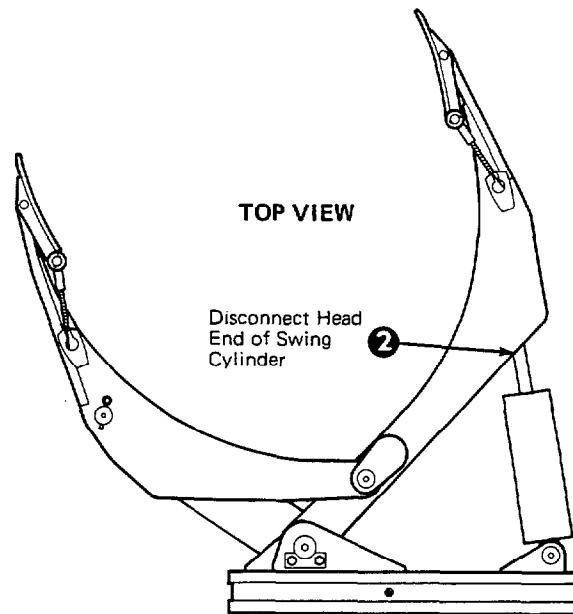
3.5 Revolving Connection

3.5-1 Plumbing

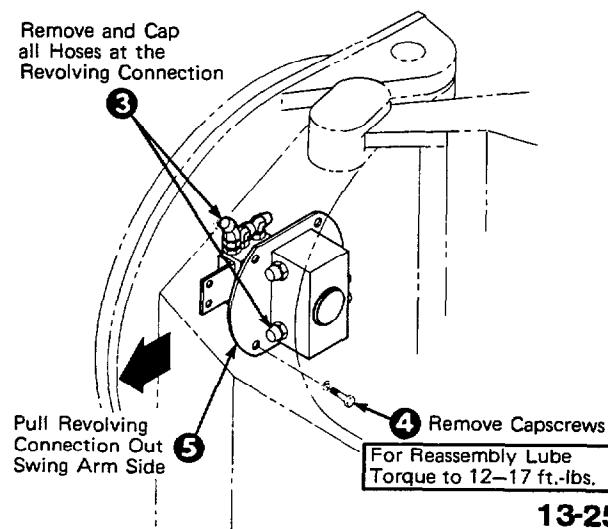


3.5-2 Removal and Installation

- 1 Set the attachment on the floor following procedure A on page 13-16.
- 2 Disconnect the head end of the swing cylinder.



- 3 Mark the hoses with the port callouts. Remove and cap the hoses to all the fittings on the revolving connection.
- 4 Remove the four plate capscrews.
- 5 Remove the revolving connection out through the swing arm side.



Section 3 Service

3.5-3 Revolving Connection Service

Disassembly

- ① Remove the snap ring.
- CAUTION: Remove any paint or burrs from the shaft end before pulling the fixed valve and shaft out of the revolving valve.
- ② Pull the fixed valve and shaft from the revolving valve.
- ③ Remove the two capscrews retaining the shaft to the fixed valve.
- ④ Remove the O-rings and Back-up rings from the shaft.
- ⑤ DO NOT remove any of the cartridges on the fixed valve.
- ⑥ Remove the cartridge valves, as shown, from the revolving valve body.

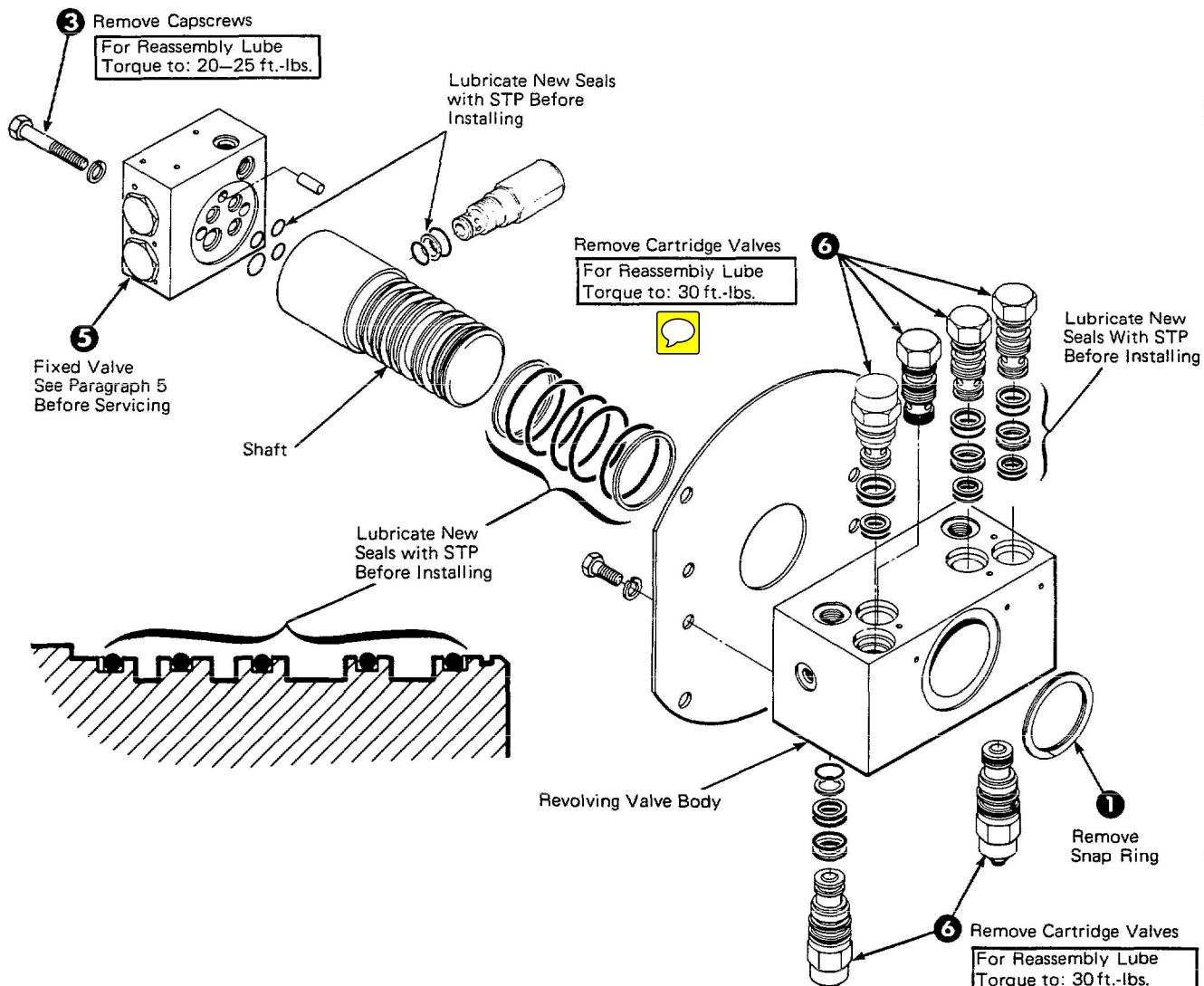
Inspection

- Thoroughly clean all parts.
- Inspect the grooves and bore of the revolving valve body for nicks and burrs. If deeply gouged then replace the part. Otherwise remove minor nicks and burrs with an emery cloth or butterfly.

NOTE: Minor nicks are those that will not cause a bypass of oil when the revolving connection is operating.

Assembly

- Lubricate all new seals with STP and install as shown.
- Reinstall the shaft on the fixed valve body before installing in the revolving valve body.
- Take special care when sliding the shaft through the revolving valve body. Do not damage the bore.
- Reinstall the check valve cartridges. Do not damage the cartridge seals.



Waterman Solenoid Valve

3.6-1 Remove and Service



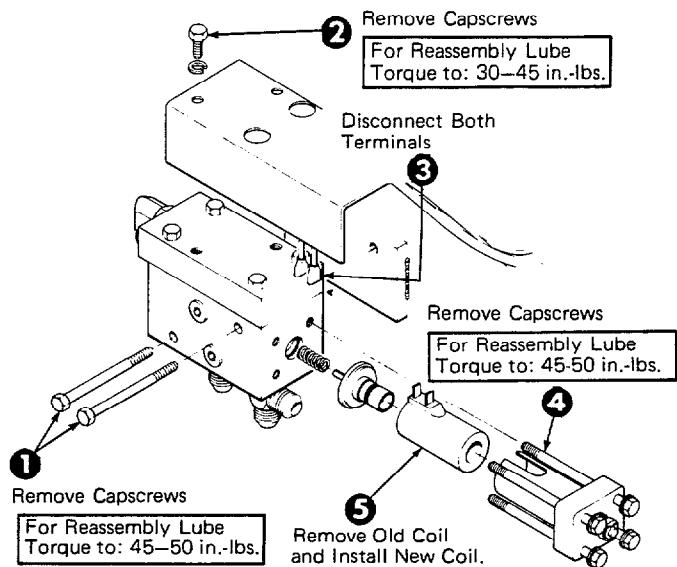
WARNING: Disconnect the ground cable from the battery on internal combustion trucks or disconnect the truck battery on electric trucks.

- 1 Remove the two mounting capscrews.
- 2 Remove the two cover capscrews.
- 3 Remove the cover and disconnect the wires as shown.
- 4 Remove the four retaining capscrews and end cap.
- 5 Remove the old coil and install the new coil.

CAUTION: Always replace the old coil with the same voltage new coil.

Reverse the above procedures to reassemble and install on truck.

WARNING: Disconnect the ground cable from the battery on internal combustion trucks or disconnect the truck battery on electric trucks.



CAUTION: Always Replace Old Coil with Same Voltage New Coil.

Racine Solenoid Valve Remove and Service



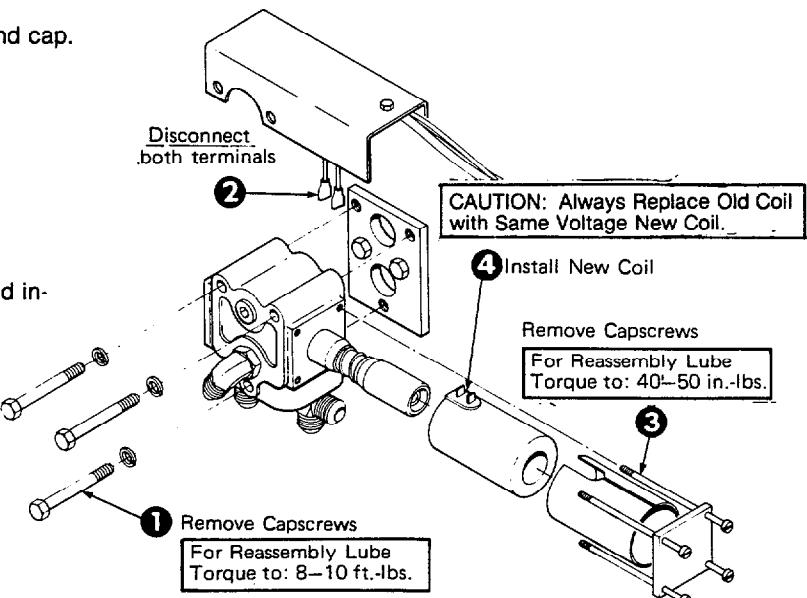
WARNING: Disconnect the ground cable from the battery on internal combustion trucks or disconnect the truck battery on electric trucks.

- 1 Remove the three mounting capscrews.
- 2 Remove the cover and disconnect the wires as shown.
- 3 Remove the four retaining capscrews and end cap.
- 4 Remove the old coil and install the new coil.

CAUTION: Always replace the old coil with the same voltage new coil.

Reverse the above procedures to reassemble and install on truck.

WARNING: Disconnect the ground cable from the battery on internal combustion trucks or disconnect the truck battery on electric trucks.



Section 3 Service

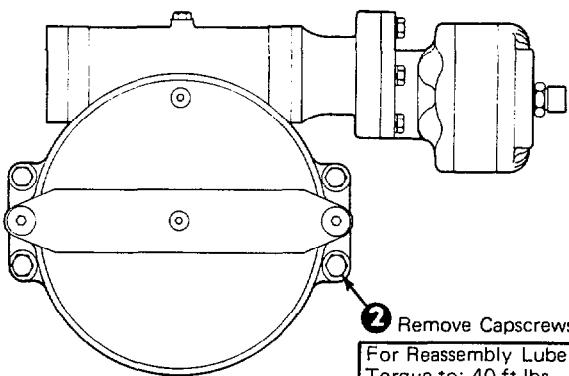
3.8 Rotator Drive Group

3.8.1 Removal and Installation

- 1 Set the attachment on the floor following procedure A on page 13-16.
- 2 Remove the four gearcase retaining capscrews.



WARNING: The baseplate is free to rotate when the gearcase is removed. Therefore, keep your hands and clothing clear of the baseplate, to avoid being pinched.

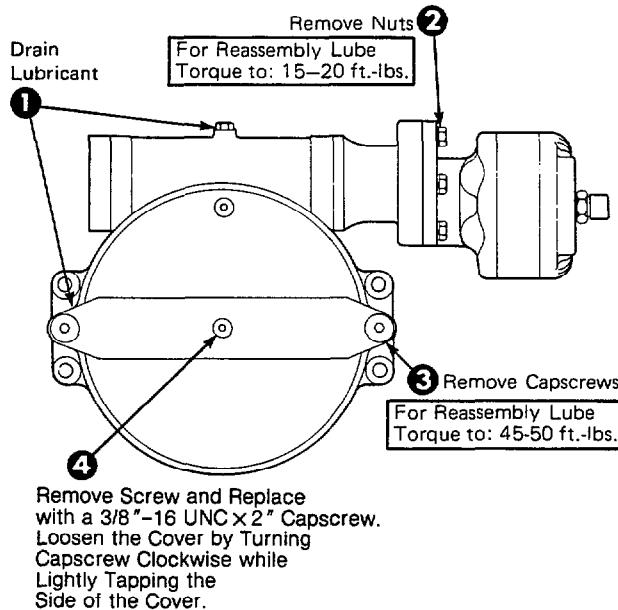


2 Remove Capscrews
For Reassembly Lube
Torque to: 40 ft-lbs.

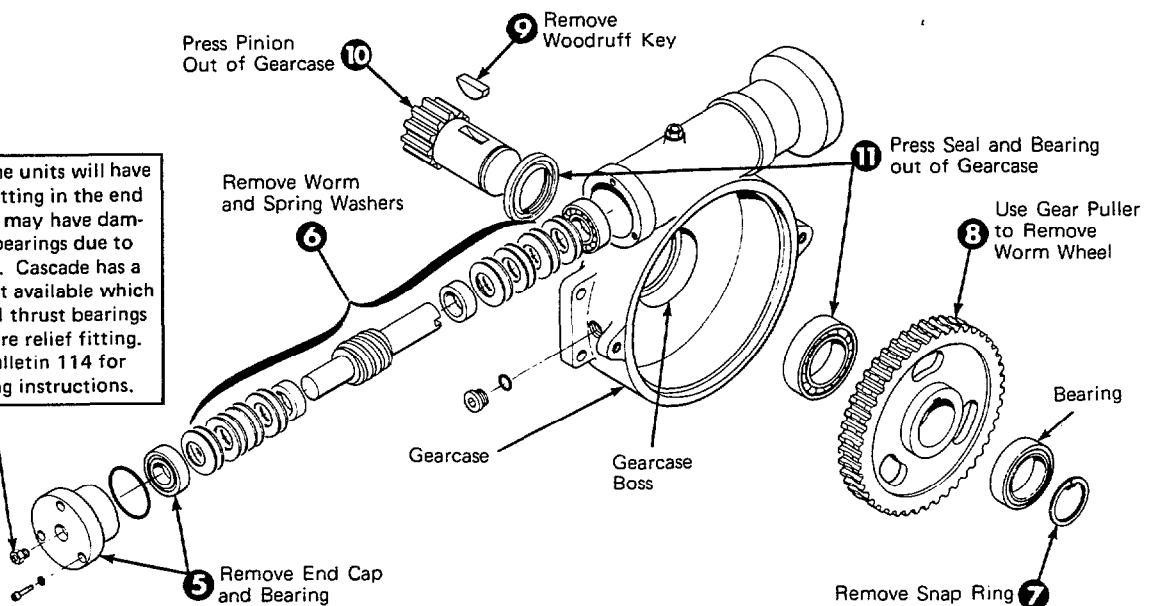
See CAUTION in paragraph 2.

3.8.2 Disassembly

- 1 Drain the lubricant, and lay the gearcase (pinion down) on 4 x 4's placed on either side of the pinion.
- 2 Remove the six motor retaining nuts.
- 3 Remove the two cover retaining capscrews.
- 4 Remove the center screw and replace with a 3/8"-16 UNC x 2" capscrew. Turn the capscrew clockwise while lightly tapping the side of the cover with a plastic-head hammer to loosen the cover.
- 5 Remove the endcap and bearing.
- 6 Remove the worm and spring washers.
- 7 Remove the snap ring from the pinion shaft.
- 8 Use a gear puller to remove the worm wheel.
- 9 Remove the woodruff key from the pinion shaft.
- 10 Press the pinion out of the gearcase.
- 11 Press the seal and bearing out of the gearcase.
- 12 Replace any item that is worn or galled. Remove any burrs with an emery cloth or small hand grinder.



CAUTION: Some units will have this style relief fitting in the end cap. These units may have damaged ball thrust bearings due to low rotator fluid. Cascade has a drive box lube kit available which provides new ball thrust bearings and a new pressure relief fitting. See Technical Bulletin 114 for complete ordering instructions.

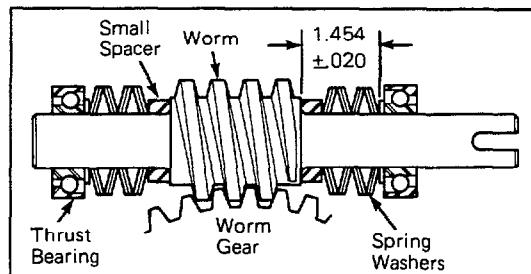
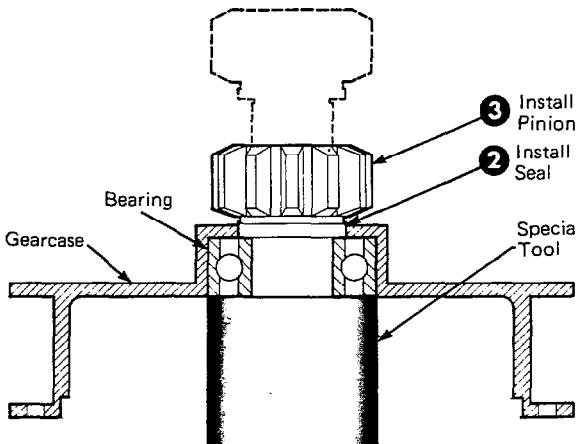
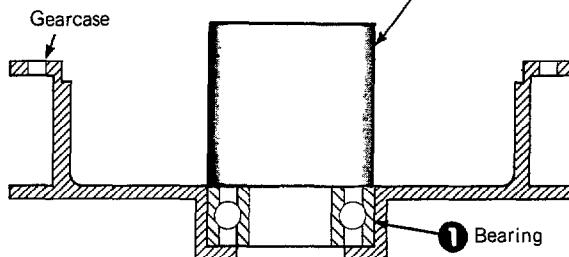
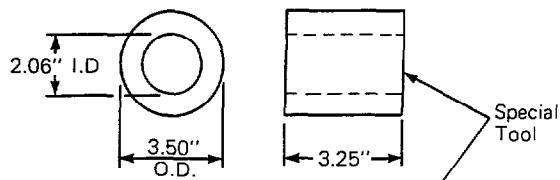


Section 3 Service

3.8-3 Reassembly

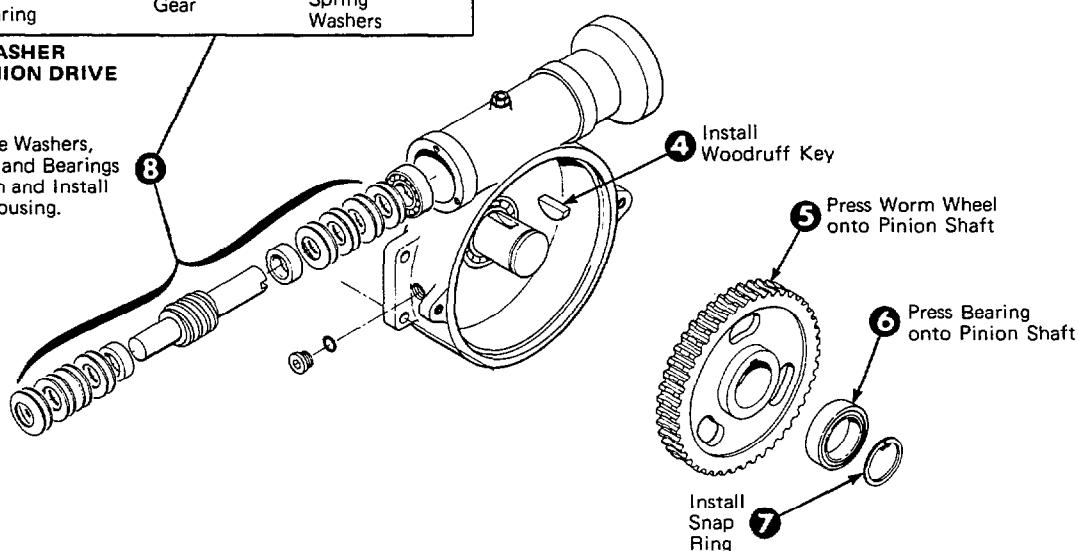
- 1 Press the bearing into the housing from inside, with the help of the special tool (C-664620) shown. Make sure the bearing is fully seated and flush with the inside of the gearcase.
- 2 Install the seal into the boss of the housing (from outside of the housing). Lip must be facing inward. Seal should be flush with boss.
- 3 Support the bearing from inside with the special tool and press the pinion into the bearing from the outside.
- 4 Install the woodruff key into the pinion shaft.
- 5 Press the worm wheel onto the pinion shaft and align with the woodruff key.
- 6 Press the bearing onto the pinion shaft.
- 7 Reinstall the snap ring.
- 8 Assemble the spring washers, spacers and ball thrust bearings (See Caution below) on the worm shaft and install in the housing.

CAUTION: The ball thrust bearing must be assembled on the worm with the thickest portion of the outer race (the side stamped with the manufacturer and part number) facing away from the washers.



16-WASHER CUSHION DRIVE

Assemble Washers, Spacers, and Bearings on Worm and Install in the Housing.

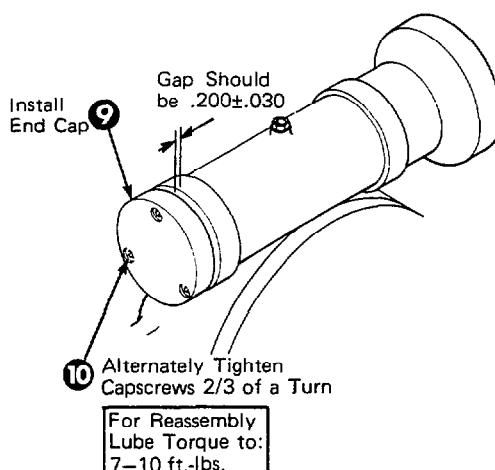


Section 3 Service

3.8.3 Reassembly (Cont.)

9 Install the endcap. If the gap is more or less than shown, the spring washers were incorrectly stacked. Remove the worm and restack the spring washers as shown in Step 8.

10 Then alternately tighten the endcap capscrews 2/3 of a turn. Tighten the capscrews to a torque of 7—10 ft.-lbs.



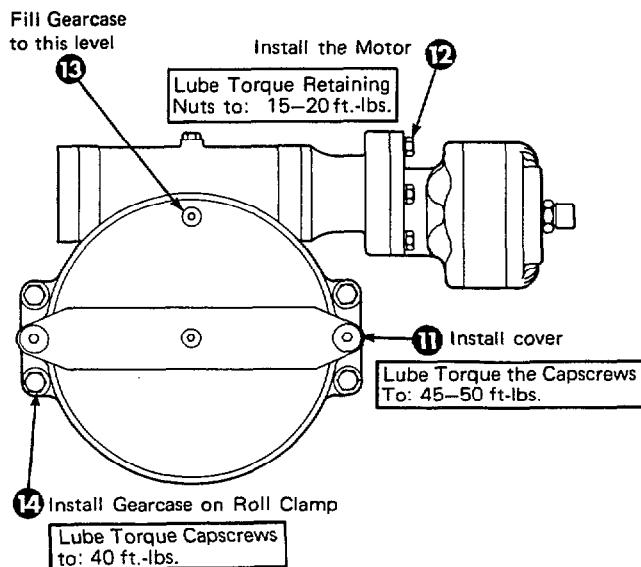
11 Reinstall the cover.

12 Reinstall the motor.

13 Fill the gearcase with 44 fluid ounces of Keystone WG-1 lube (Cascade part no. C-656300).

NOTE: C-656300 = 32 fluid ounces.

14 Install the gearcase on the rotator baseplate.



3.9

Motor

3.9-1 Motor Removal and Installation

The rotator motor can be removed for service with the attachment on the truck.



WARNING: Before removing supply hoses, relieve pressure that might be present in the hydraulic system. With the truck off, open the truck auxiliary control valves several times in both directions.

- 1 Remove, cap, and tag the supply hoses to the motor.
- 2 Remove the motor from the rotator drive assembly by removing the six retaining nuts. Slide the motor out of engagement and remove the coupling and key from the motor shaft. A small amount of rotator fluid might spill when the motor is removed.

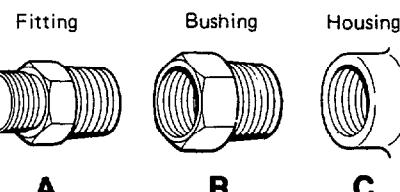
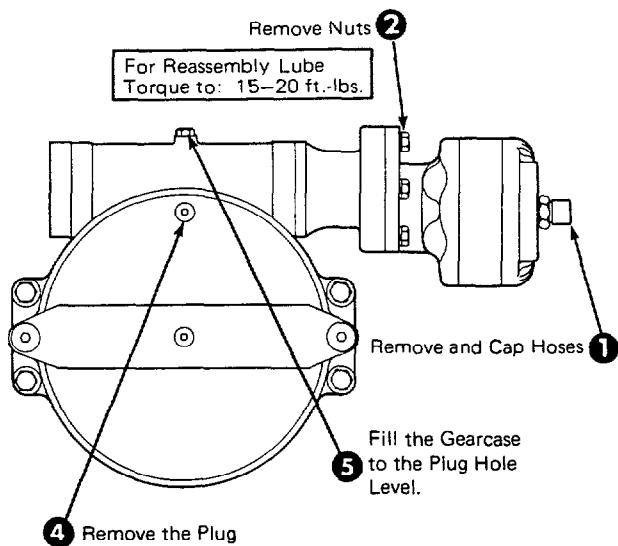
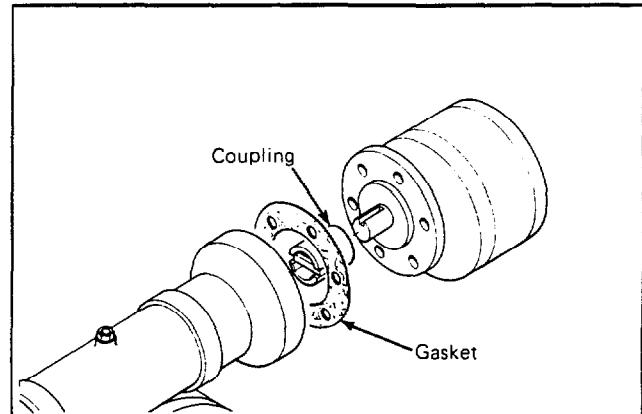
- 3 Clean the motor and gear case mating surfaces with solvent. Apply LOCTITE 515 sealer to these surfaces. Install the motor and tighten the retaining nuts to a torque of 15—20 ft.-lbs. (Lubed).

CAUTION: Because the threaded part on the motor is tapered, overtightening the fitting in the port will split the housing. Fittings should be snug but not overtightened. Install reducers and fittings as follows:

Thread hose fitting (A) into bushing (B) until tight. Fit the assembly of the bushing and fitting (A + B) into the housing (C). Tighten the bushing (B) **only**. Any attempt to tighten the hose fitting after installation in the bushing may result in a cracked housing.

CAUTION: If rotator fluid was spilled when the motor was removed, perform the following:

- 4 Remove the plug at the top of the side cover.
- 5 Fill the gearcase to the plug hole level with Keystone WG-1 (Cascade part no. C-656300). Install the plug.



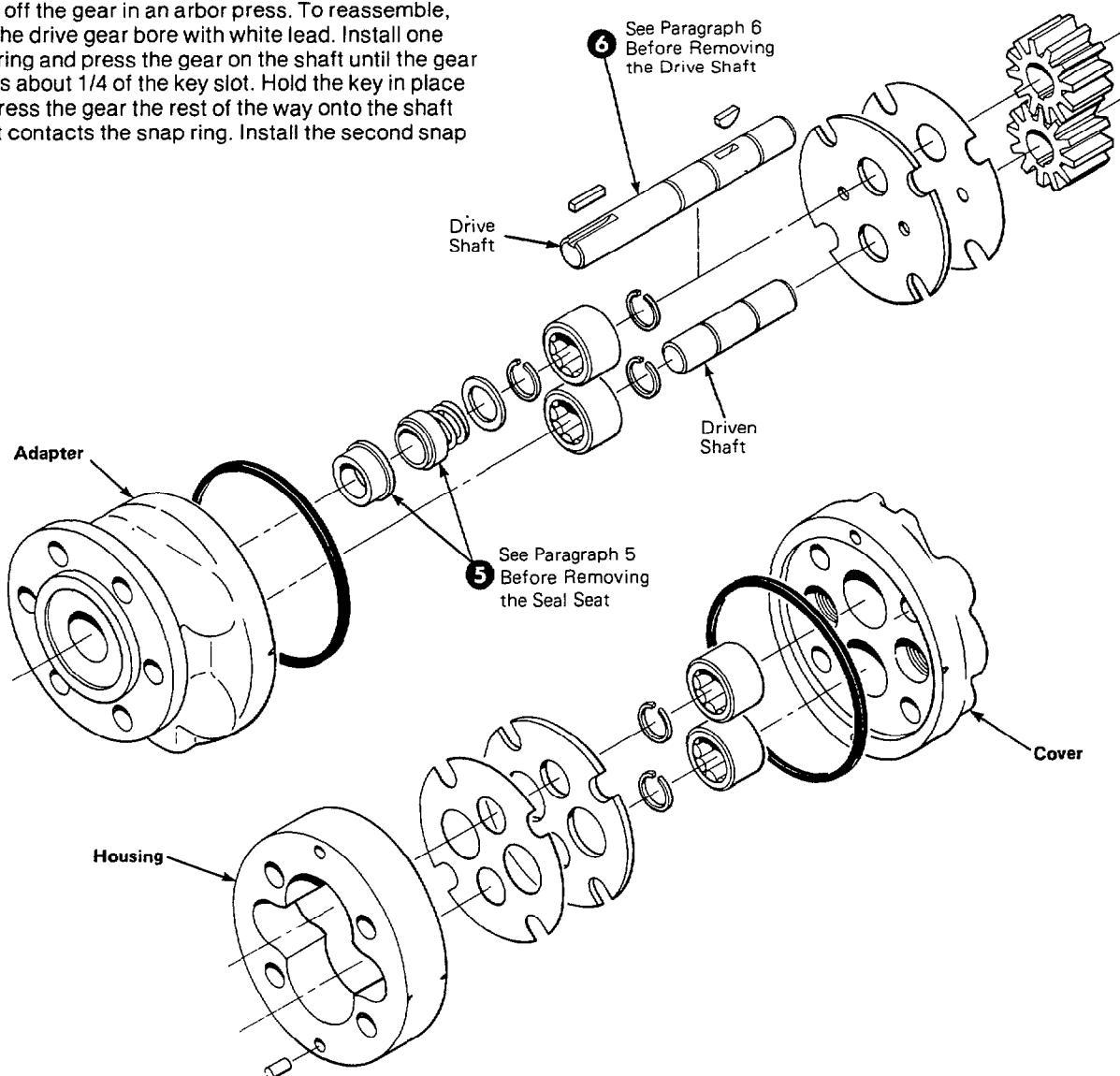
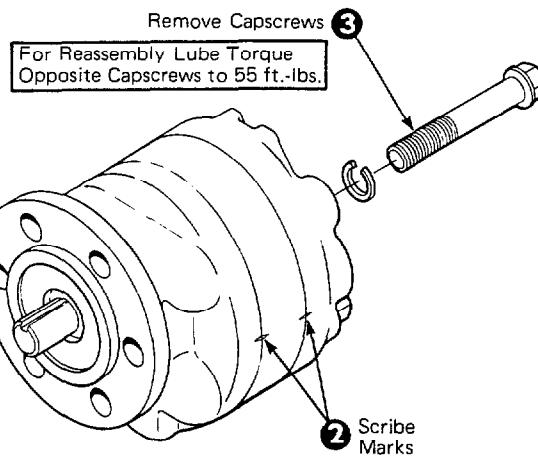
3.9

Motor Disassembly and Reassembly

Cascade only services the adapter and cover, the drive shaft and the seal kit which includes the seal seat and seat assembly and the 2 large O-rings. Due to cost, if any other parts need replacement, it is cost effective to replace the complete motor assembly. The instructions below are for replacing the seal kit, drive shaft, adapter and cover only.

IMPORTANT: Service the motor in a clean work area.

- 1 Clean the outside of the motor and dry thoroughly. Remove any sharp edges or burrs.
- 2 Mark the sections of the motor with a punch or scribe for matching during reassembly.
- 3 Remove the four capscrews from the motor cover.
- 4 With a fibre hammer, tap the cover to loosen and remove it.
- 5 Inspect the seal seat. Replace only if the sealing face is excessively worn or damaged. Remove it by inverting the adapter and driving out the seat with a wooden block. Press the new seat into the adapter.
- 6 To replace the drive shaft, remove the snap ring and press off the gear in an arbor press. To reassemble, coat the drive gear bore with white lead. Install one snap ring and press the gear on the shaft until the gear covers about 1/4 of the key slot. Hold the key in place and press the gear the rest of the way onto the shaft until it contacts the snap ring. Install the second snap ring.



3.10

Junction Block

Disassembly

- ① Label, remove and cap the hoses at the junction block.
- ② Remove the junction block mounting capscrews and lift the junction block off the carriage.
- ③ Remove the shaft snap ring.
- ④ Remove all parts as shown.

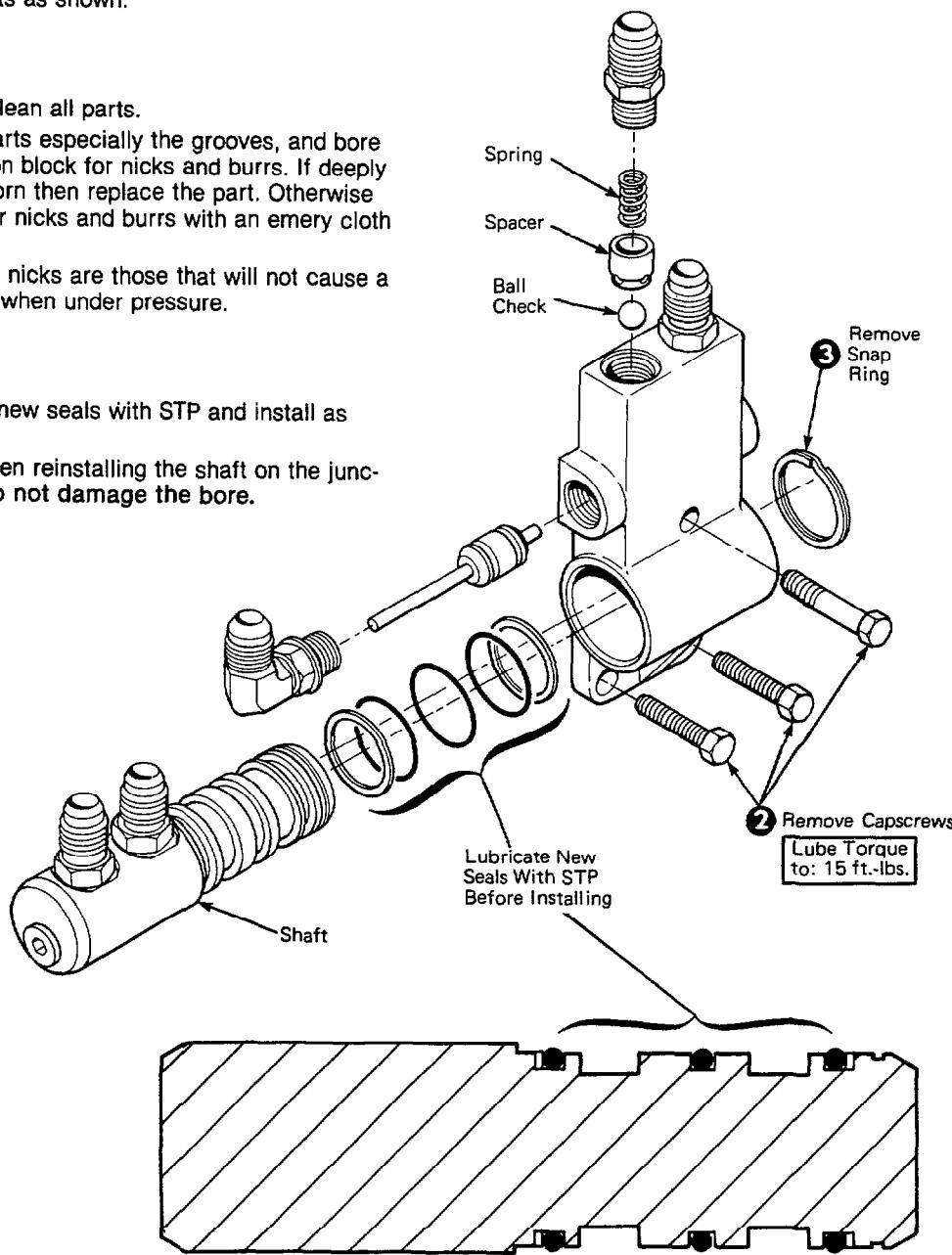
Inspection

- Thoroughly clean all parts.
- Inspect all parts especially the grooves, and bore of the junction block for nicks and burrs. If deeply gouged or worn then replace the part. Otherwise remove minor nicks and burrs with an emery cloth or butterfly.

NOTE: Minor nicks are those that will not cause a bypass of oil when under pressure.

Reassembly

- Lubricate all new seals with STP and install as shown.
- Take care when reinstalling the shaft on the junction block. Do not damage the bore.



Section 3 Service

3.11 Frame Assembly

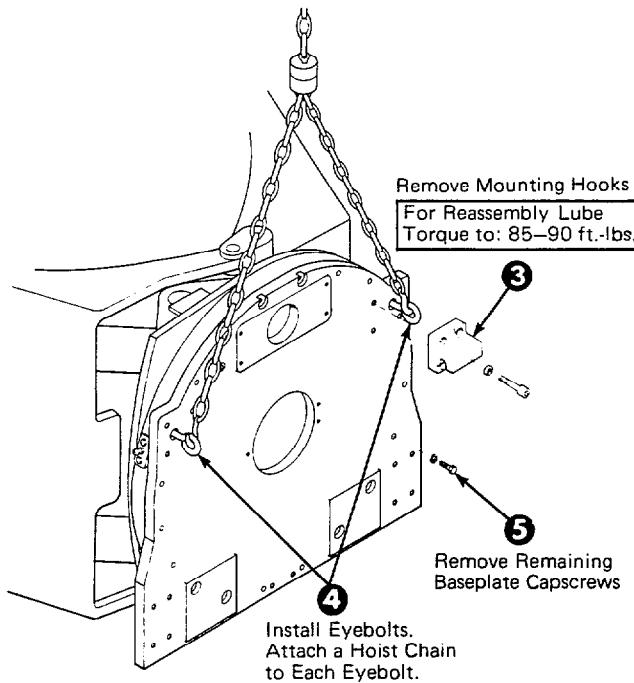
3.11-1 Baseplate Removal

- 1 Set the attachment on the floor following procedure A on page 13-16.
- 2 Remove the drive group (see page 13-28) and the revolving connection (see page 13-25) before continuing.
- 3 Remove the upper mounting hooks.
- 4 Replace the capscrews under the upper mounting hooks with eyebolts. Attach a hoist chain to each eyebolt.



WARNING: Be sure to attach a hoist chain to each eyebolt before removing the remaining baseplate capscrews. Make sure your overhead crane has a rated capacity of at least 1000 lbs.

- 5 Remove the remaining 18 baseplate capscrews.



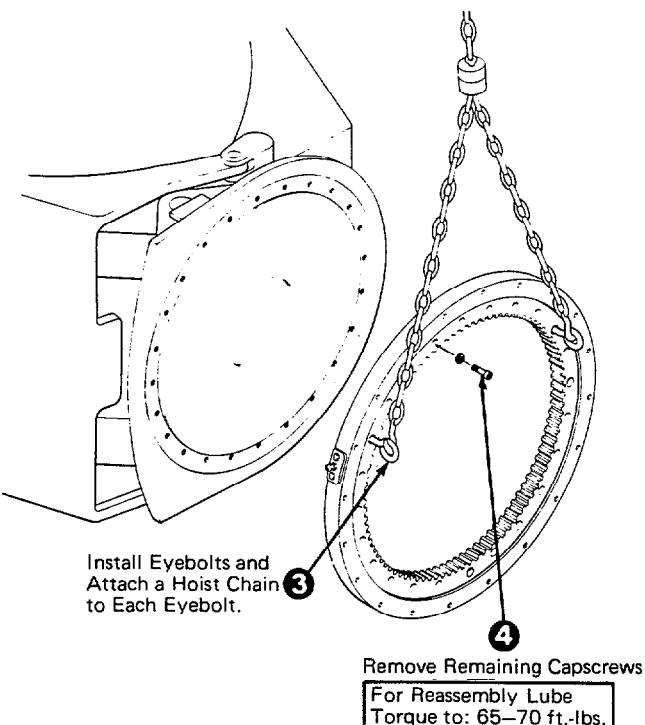
3.11-2 Ring Gear/Bearing Assembly Removal

- 1 Set the attachment on the floor following procedure A on page 13-16.
- 2 Remove the drive group (see page 13-28), the revolving connection (see page 13-25), and the baseplate, before continuing.
- 3 Replace two capscrews on the ring gear with eyebolts, and attach a hoist chain to each eyebolt.



WARNING: Be sure to attach a hoist chain to each eyebolt before removing the remaining ring gear capscrews. The ring gear is very heavy and oily, so take care to prevent pinching or dropping on fingers or feet. Make sure your overhead crane has a rated capacity of at least 1000 lbs.

- 4 Remove the remaining capscrews and lift the ring gear and bearing assembly off the attachment.



Section 3 Service

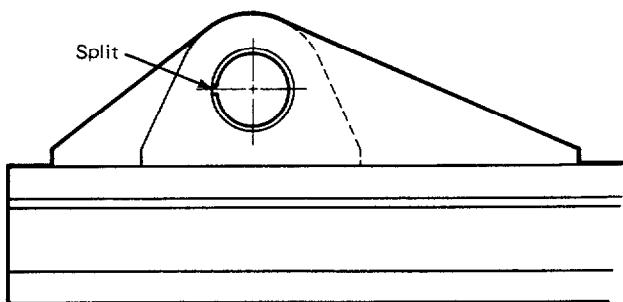
3.11-3 Frame Service

1. Bushing Replacement

NOTE: The bushings have a special grey coating on the inside surface. Be careful not to scratch or mar this surface when installing the bushing or inserting a pivot pin.

- 1 Drive the old bushing out with a bushing driver of same diameter. Do not gouge the bore surface of the frame.
- 2 Install the new bushing with a bushing driver. Drive it in flush.

Install Bushing with Split Located as Shown.



Bushing

Frame

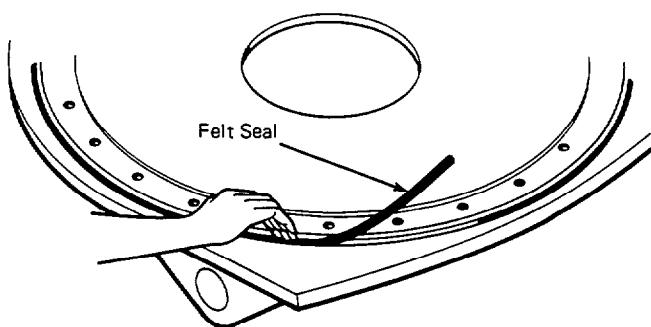
Felt Seals

Ring Gear/Bearing Assembly

Baseplate

2. Felt Seal Installation

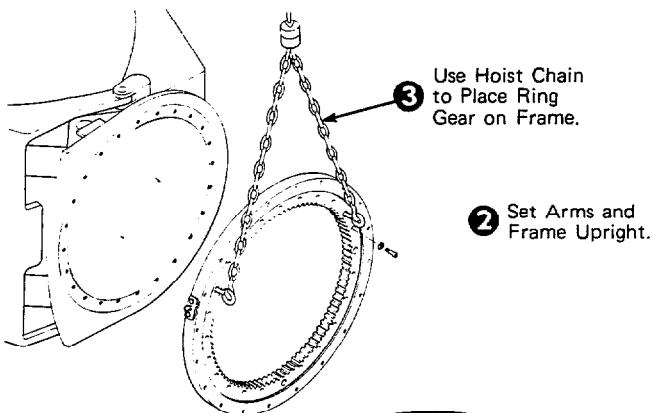
- 1 Start one end of the seal strip in the groove.
- 2 Push the seal to the bottom of the groove and compress the seal towards the end where installation began. If the seal won't fit in the groove, stretch it to provide a thinner cross section.
- 3 With the seal pushed into the groove and compressed, cut it so the two ends meet squarely.
- 4 Bond the ends with 3M brand weatherstrip adhesive No. 8001 or equivalent. After the adhesive dries, lubricate the seal with SAE 30 weight oil to swell the seal into the groove.



Section 3 Service

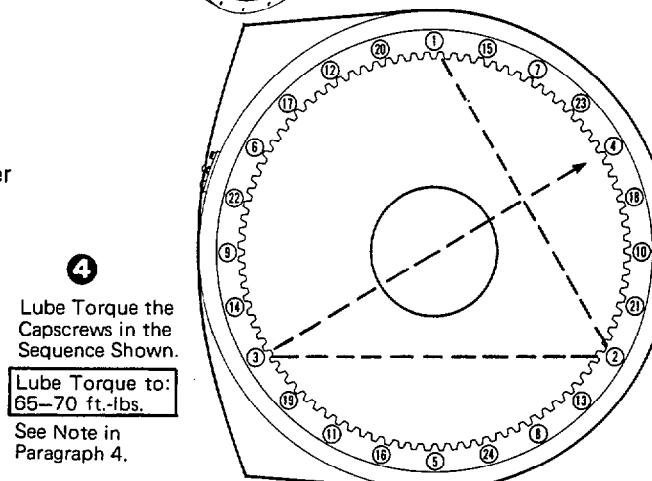
3.11-4 Reassembly

- ① To install the swing and clamp arms on the frame, see pages 13-18 and 13-20.
- ② Set the frame and arms upright.
- ③ Attach the hoist chain to the ring gear eyebolts and lift the ring gear into position.

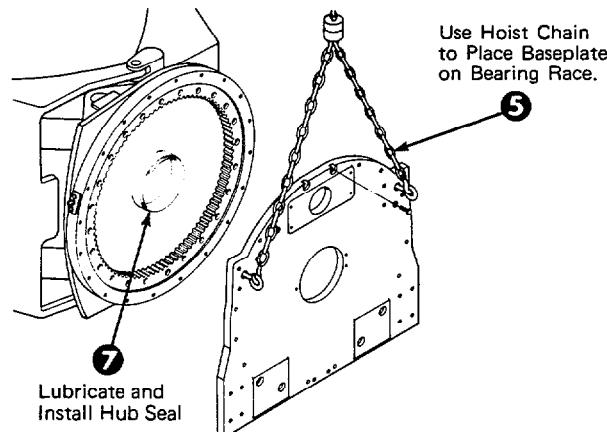


- ④ Lube torque the capscrews to 65 – 70 ft.-lbs. in order shown.

NOTE: Apply a liberal amount of NLGI consistency No. 0 grease to the teeth of the ring gear. It is important that the ring gear teeth be lubricated before assembly.



- ⑤ Using the hoist chain, lift the baseplate into position on the bearing race.

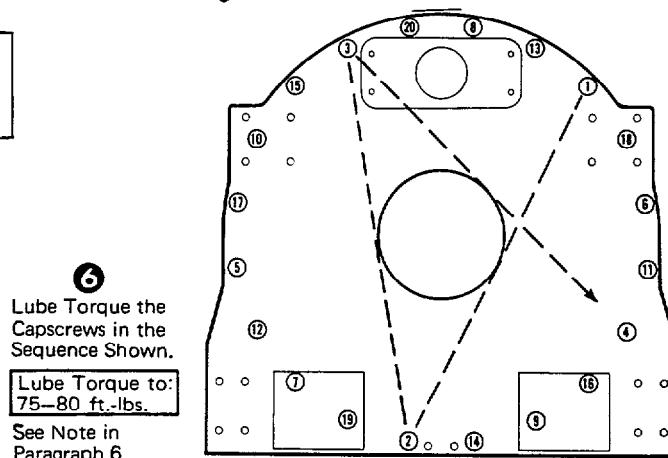


- ⑥ Lube torque the capscrews to 75 – 80 ft.-lbs. in the order shown.



WARNING: The capscrews bolting the baseplate to the bearing race must be grade 5 minimum.

- ⑦ Lubricate the hub seal and install.
- ⑧ Reinstall the revolving connection, see page 13-25.
- ⑨ Reinstall the drive group, see page 13-28.
- ⑩ Lubricate the ball bearing race through the zerk fitting on the ring gear/bearing assembly.
- ⑪ To reinstall the attachment on the truck see the Installation Instructions, Section 4, or reverse the procedures on page 13-16.



4.0

Introduction

Important

Because of the 70E's unique operating system, the procedures in this instruction manual must be followed carefully for proper attachment installation. Failure to follow these instructions EXACTLY could result in the attachment not working properly or not working at all.

Since there is a significant difference between the 70E hydraulic system and a standard roll clamp hydraulic system, take care in plumbing the 70E to a lift truck which previously had a standard roll clamp attached.

4.1

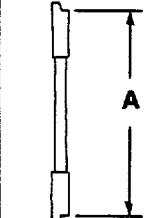
Truck System Requirements

- Minimum hose and fitting size: No. 8 (1/2 inch ID) with minimum fitting orifices of 1 $\frac{1}{32}$ inch.
- Minimum number and type of truck auxiliary valves: 2, closed-center valves (the valves may be operated either by individual control handles or by a single control handle).

IMPORTANT

If your truck is equipped with open-center valves, contact Cascade Customer Service (Dial Directline 800-547-5266, toll-free) prior to installing the attachment.

- Maximum truck pressure to the attachment: 2000 psi.
- Recommended minimum truck oil volume output to the attachment: 15 GPM.
- Truck carriage must conform to Industrial Truck Association (ITA) dimensional standards as shown below.



| Mounting | Dimension A(in.) | |
|-----------|------------------|-------|
| | Min. | Max. |
| Class III | 18.68 | 18.74 |
| Class IV | 23.44 | 23.50 |



WARNING: Rated capacity of the truck/attachment combination is a responsibility of the original truck manufacturer and may be less than shown on the attachment nameplate. Consult the truck nameplate.

4.2 Hose Reel Installation

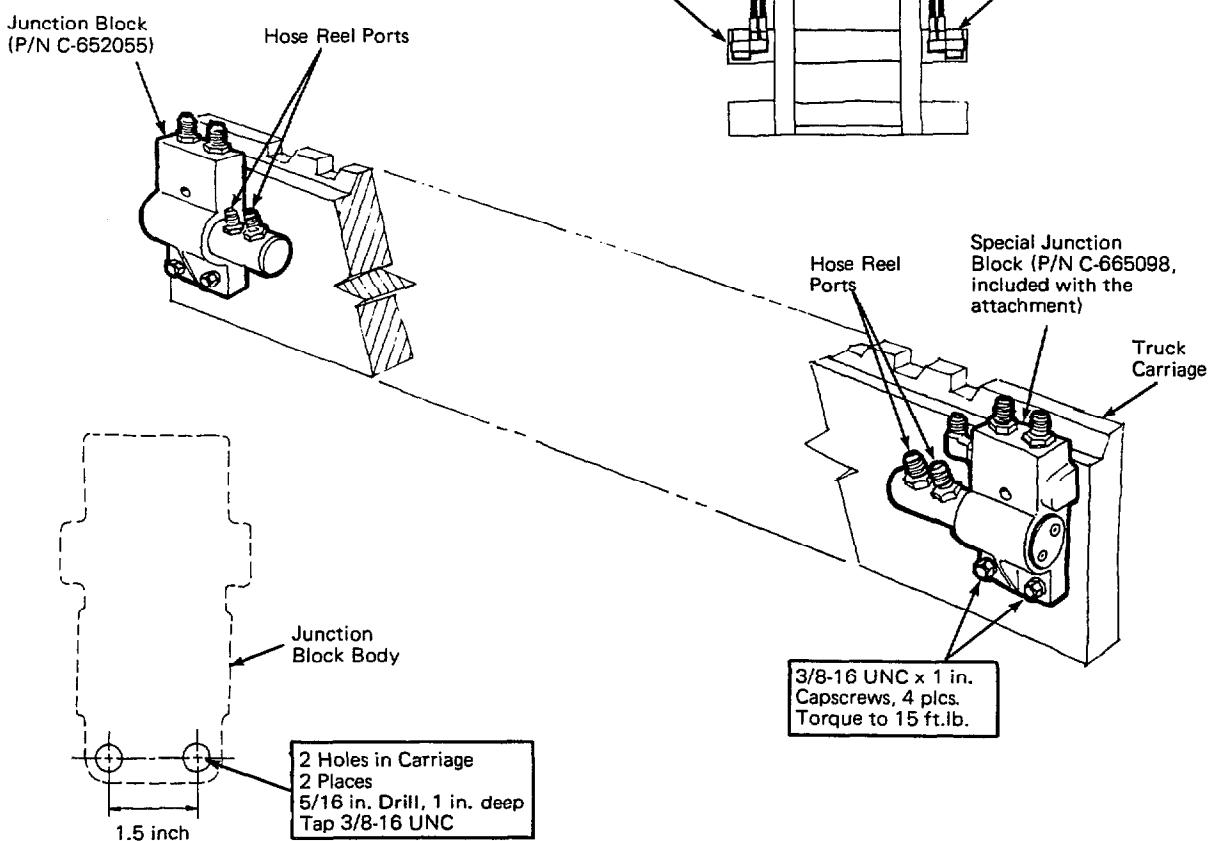
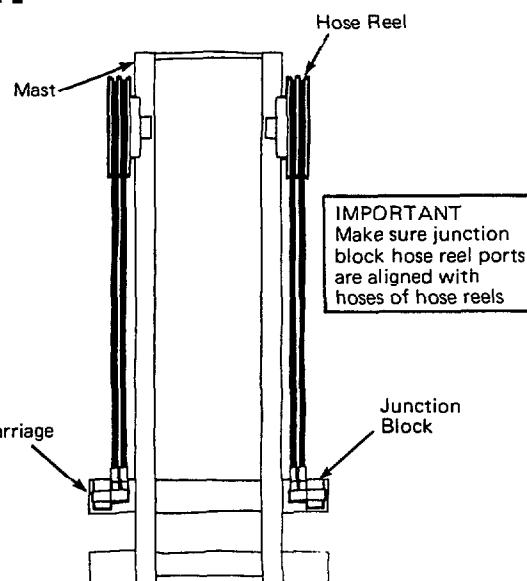
Your truck must be equipped with some method to route four No. 8 hoses between the truck-mounted control valves and the attachment. You may use two hose reels, mast internal hose sheaves, counter-weighted hose sheaves, etc.

For most installations, Cascade recommends using two 14.5-inch diameter hose reels, Cascade Model H8L (P/N C-646042) on the left-hand side and Cascade Model H8R (P/N C-646043) on the right-hand side. If the attachment is to be installed on a high-lift mast, larger hose reels may be required. Consult the Cascade Hose Reel Selection Guide (form 4031) or contact Cascade Customer Service. Install the hose reels according to the Instructions supplied with the reels.

4.3 Junction Block Installation (for use with hose reels)

Install two junction blocks on the back side of the truck carriage upper crossbar as shown below. Use the special junction block included with the attachment on the right-hand side of the carriage. Cascade recommends using a junction block without checks (P/N C-652055) on the left-hand side.

Locate the junction blocks so the hose reel ports of the blocks are aligned between the flanges of their respective hose reels.



4.4

Solenoid Valve Installation

Select some convenient location on the truck to install the solenoid valve assembly. Cascade recommends that, on most lift truck installations, somewhere on the front of the truck cowl is a good location. Make sure the location you select does not interfere with the operation of any other lift truck components (mast, hoses, tilt cylinders, etc.). It makes no difference if the solenoid valve assembly is positioned as shown below or upside-down, or oriented in any other way.

4.4-1 Racine Solenoid Valve

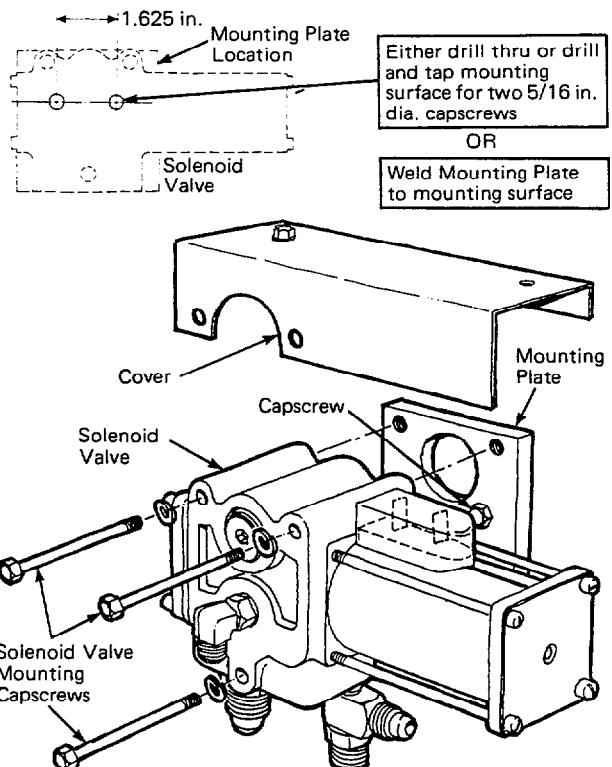
1. Remove the solenoid valve mounting plate and cover from the solenoid valve assembly by removing the three mounting capscrews.
2. Locate and secure the mounting plate to the mounting surface.

IMPORTANT

If you secure the mounting plate with capscrews, make sure the heads of the capscrews are on the side facing the solenoid valve.

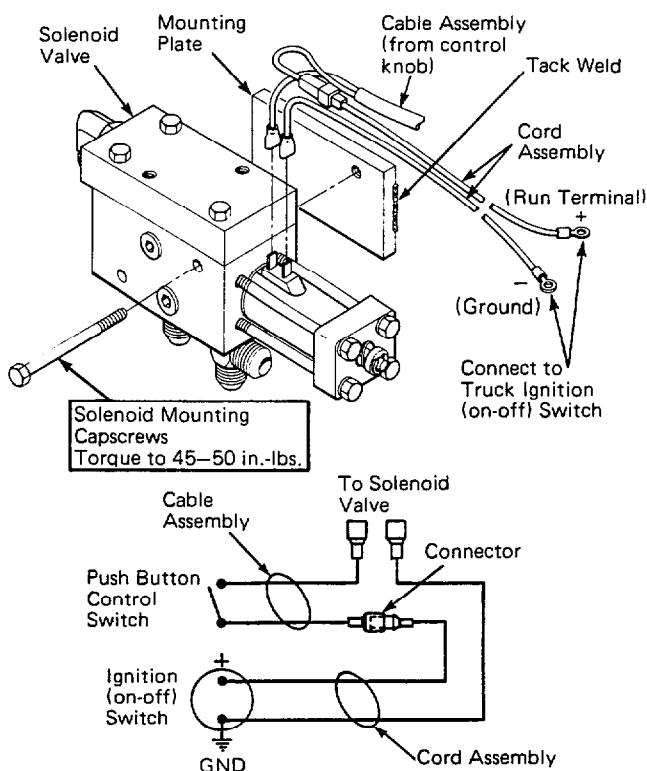
3. Secure the solenoid valve to the mounting plate using the capscrews removed in Step 1.

NOTE: Do not install the cover at this time. You will need the cover off to gain access to the solenoid valve electrical connections later.



4.4-2 Waterman Solenoid Valve

1. Disconnect the ground cable from the battery (internal combustion trucks) or disconnect the truck battery (electric trucks).
2. Tack weld the mounting plate to the mounting surface using a mild steel welding rod.
3. Place the solenoid on the mounting plate and torque the mounting capscrews to 45 – 50 in.-lbs.

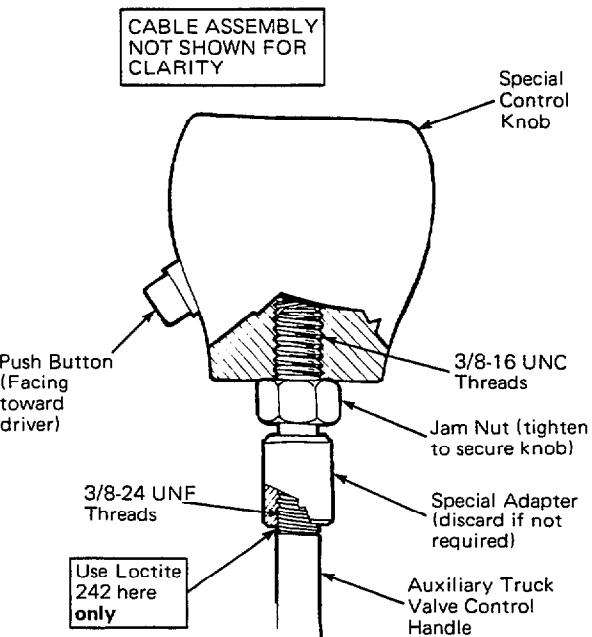


4.5 Auxiliary Valve Control Knob Installation

A special control knob, which includes an electrical switch and wiring to control the solenoid valve, is included with the attachment.

- If the auxiliary valves on your truck are controlled by individual handles, the knob should be installed on the handle closest to the operator when he is in the driver's seat.
- If the auxiliary valves on your truck are controlled by a single handle, install the knob on the single control handle.

Remove the existing knob from the appropriate auxiliary valve control handle and install the special knob as shown. If the control handle is not threaded, weld on the special adapter and install the knob as shown. It may be necessary to saw off a portion of the handle to achieve a comfortable length.



Section 4 Installation Instructions

4.5-1 Control Knob Placard Installation

The control knob placard is a disc with printing on both sides that may be installed on top of the control knob with either side showing.

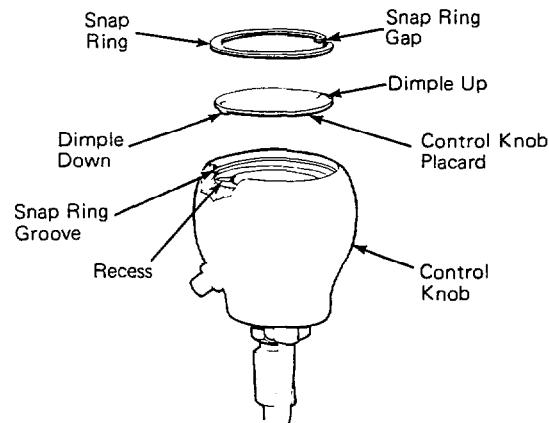
If your truck auxiliary valves are operated with a single control handle, the side marked "A" should be visible on the knob. If your truck auxiliary valves are operated with individual control handles, the side marked "B" should be visible.



A Visible on trucks with
a single handle controlling
auxiliary valves



B Visible on trucks with
individual (two handles)
controlling auxiliary valves

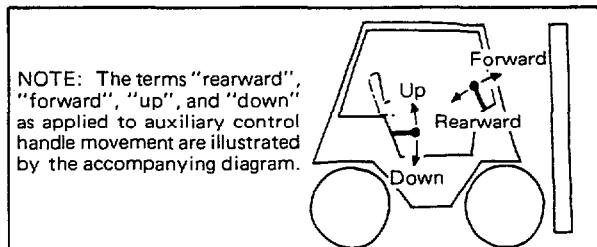


4.6 Hydraulic Port Identification

4.6-1 Truck Auxiliary Valves

The 70E hydraulic system is designed so that operation of the truck auxiliary valve control handle(s) conforms to industry standard practice as described by the following chart.

| Function, listed in sequence of location to operator | Attachment movement | Motion of the operator's hand when actuating the truck auxiliary control handle while facing the load |
|--|------------------------|---|
| Swing | Retract | Rearward or Up |
| | Extend | Forward or Down |
| Rotate | Clockwise | Rearward or Up |
| | Counterclockwise | Forward or Down |
| Clamp | Clamp | Rearward or Up |
| | Release | Forward or Down |



NOTE: The terms "rearward", "forward", "up", and "down" as applied to auxiliary control handle movement are illustrated by the accompanying diagram.

On trucks with the auxiliary valves controlled by individual handles, both "SWING" and "ROTATE" are operated by the auxiliary handle closest to the driver, and "CLAMP" is controlled by the second auxiliary handle from the driver.

On trucks with the auxiliary valves controlled by a single handle, both "SWING" and "ROTATE" are operated when the auxiliary handle is shifted toward the driver, and "CLAMP" is operated when the handle is shifted away from the driver.

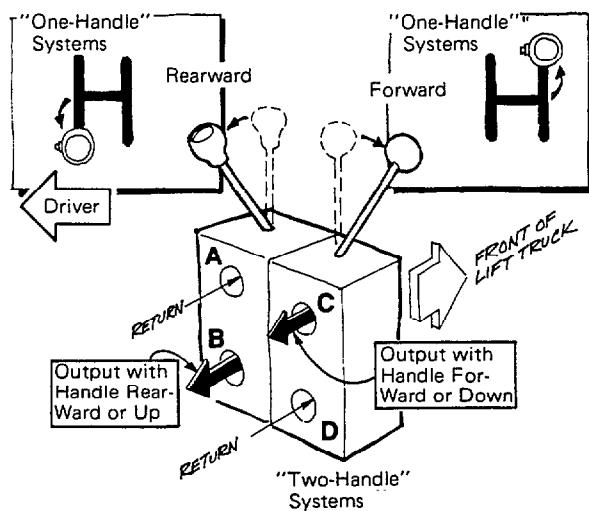
Thus, prior to connecting hoses to the truck, it is vital that you first determine which ports of the auxiliary valves supply high-pressure output when the handle(s) is shifted.

Section 4 Installation Instructions

4.6-1 Truck Auxiliary Valves (Cont.)

Determine auxiliary valve output according to the following procedures:

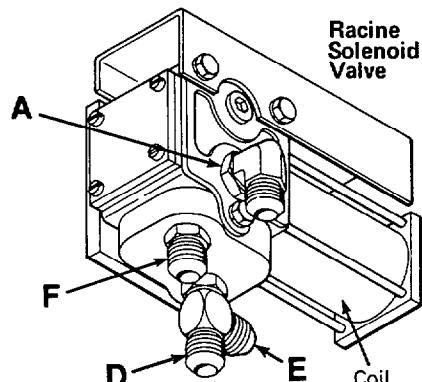
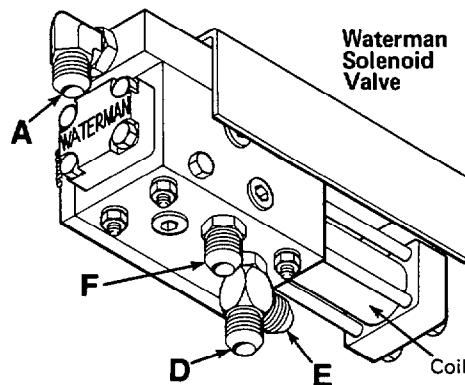
1. Connect a jumper hose to each port of both auxiliary valves. Put the ends of the hoses into a suitable container to collect oil.
2. Start the truck and briefly shift the auxiliary control handle(s) while watching the flow from the jumper hoses.
3. Mark or tag each port as follows (stick a piece of masking tape next to each port for easy marking).
 - For Trucks with Two Auxiliary Handles
 - a. Shift the auxiliary handle closest to the driver (the one with the special knob) forward (or down). Mark the output port "A." Mark the opposite port "B."
 - b. Shift the second auxiliary handle forward (or down). Mark the output port "C." Mark the opposite port "D."
 - For Trucks with One Auxiliary Handle
 - a. Shift the auxiliary handle toward the driver and forward (or down). Mark the output port "A." Mark the opposite port "B."
 - b. Shift the auxiliary handle away from the driver and forward (or down). Mark the output port "C." Mark the opposite port "D."
4. Remove the jumper hoses.



4.6-2 Solenoid Valve

Mark the ports of the solenoid valve as shown.

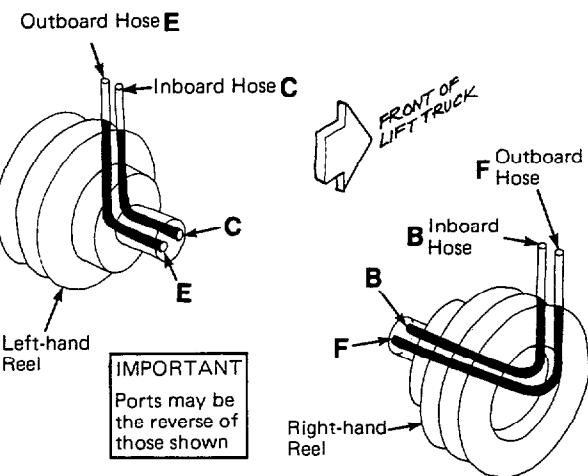
1. Mark the port on the front of the valve body "A."
2. Mark the port farthest from the coil "F."
3. Mark one port of the tee fitting installed in the port closest to the coil "D" and mark the other port of the tee fitting "E."



4.6.3 Hose Reels

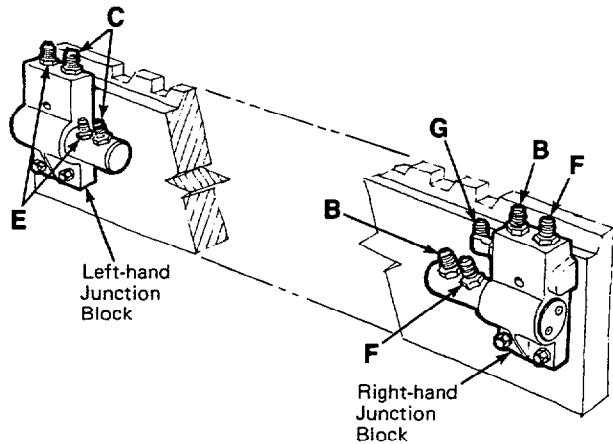
It is important to also determine the hose reel ports that correspond to the hoses of the reels. You can do this by blowing compressed air (35 psi maximum) through each hose reel port and feel which hose is in-line. Mark the hose reel ports as follows:

1. Left-hand Reel (as viewed from the driver's seat)—mark the port that is in-line with the **inboard hose "C"** and mark the opposite port "**E**."
2. Right-hand Reel (as viewed from the driver's seat)—mark the port that is in-line with the **inboard hose "B"** and mark the opposite port "**F**."



4.6.4 Junction Blocks

Mark the junction block ports as shown.

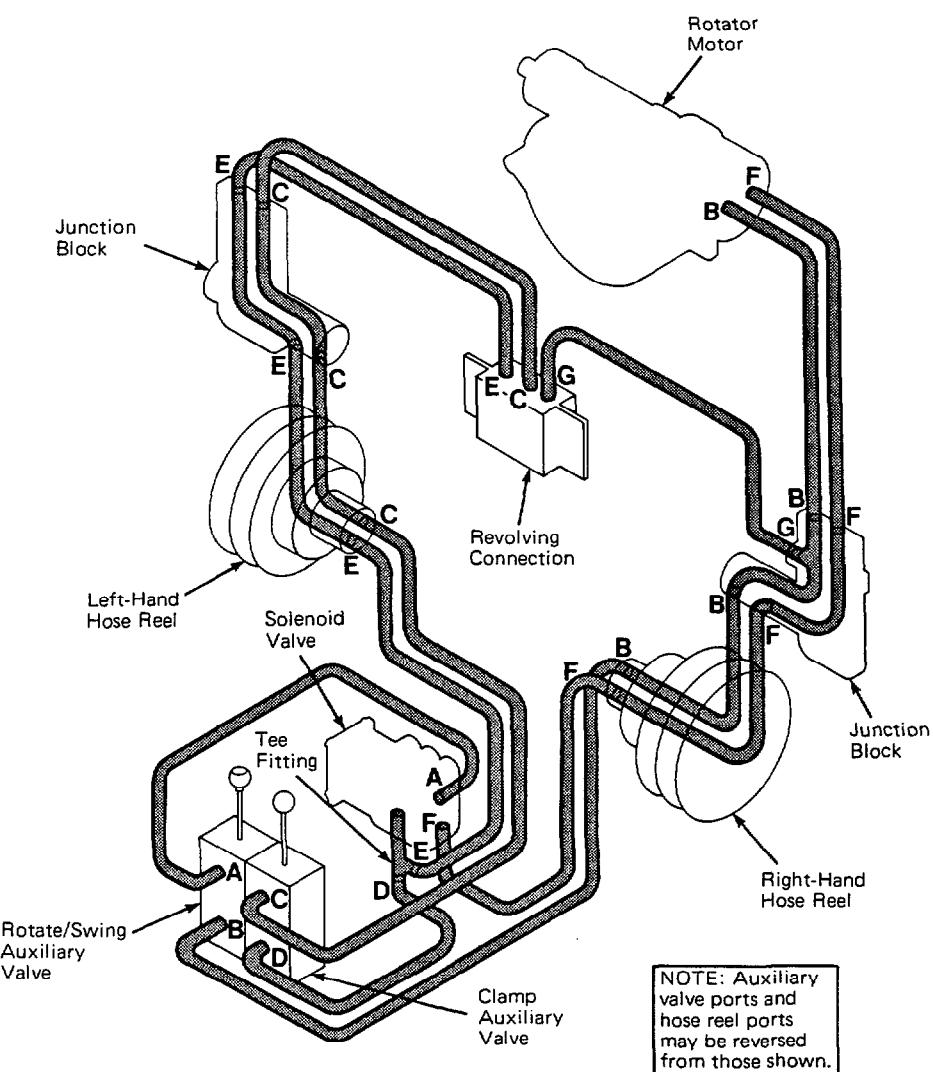


4.7

Plumbing the Truck

Connect the truck hydraulic system hoses (only as far as the junction block ports E, C, B and F), as shown below, connecting the same lettered ports together. When installing the hoses:

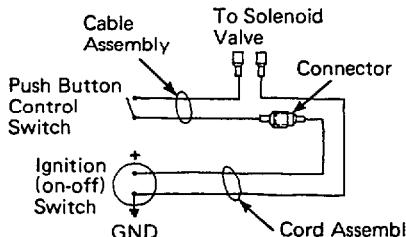
- Be careful not to twist, pinch, or otherwise damage the hoses.
- Use No. 8 hose (1/2 inch ID) with minimum fitting orifices of 1 $\frac{1}{2}$ inch.
- Use as few fittings as possible.
- Use 45° elbows instead of 90° elbows wherever possible.
- Do not route the hoses through tilt cylinder cutouts or anywhere else they may be damaged by moving components.
- As much as possible, route groups of hoses together.



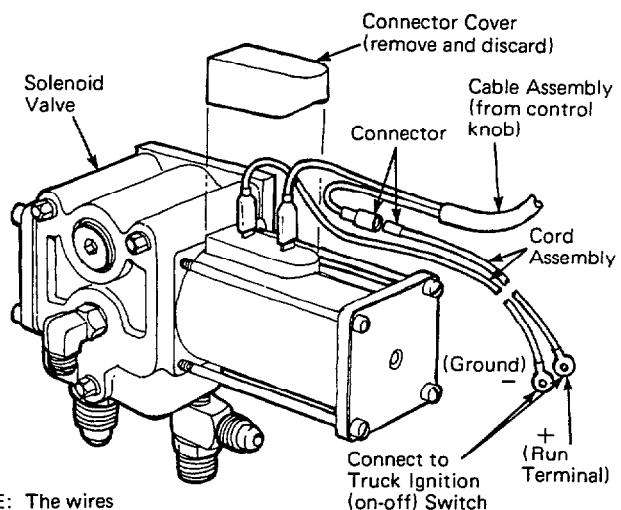
4.8

Wiring

- To prevent inadvertent contact with "hot" wires or connections, disconnect the ground cable from the battery (internal combustion trucks) or disconnect the truck battery (electric trucks).
- Route the cable assembly extending from the control knob under the floor board, cowl, etc., to the solenoid valve assembly. Make sure there is sufficient clearance around moving components. Secure the cable to the control handle near its base with the tie supplied.
- Remove and discard the connector cover from the solenoid valve assembly.
- Connect the cable assembly and the cord assembly, supplied with the attachment, to the solenoid valve and the truck ignition (on-off) switch as shown.



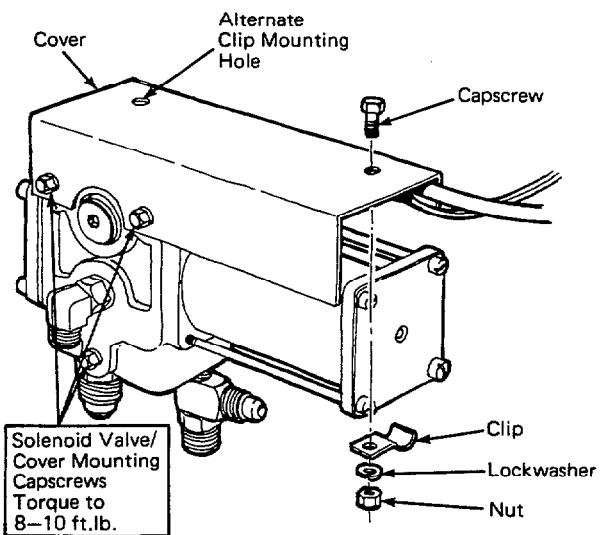
NOTE: The wires may be routed to the Solenoid Valve as shown or they may be routed to the opposite side of the valve.



4.8-1

Install the Racine Cover as follows:

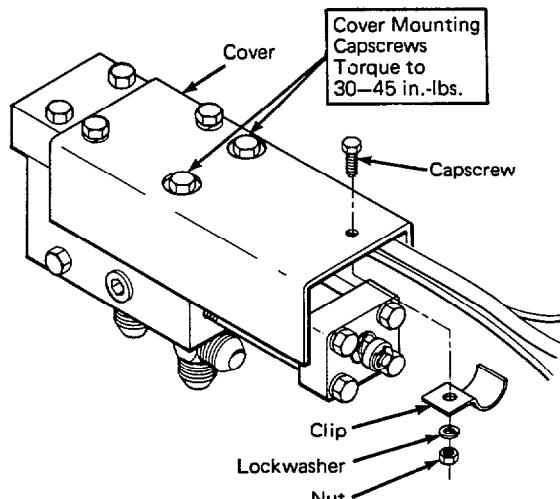
- Install the solenoid valve cover using the two mounting capscrews as shown.
- Secure the cable assembly to the cover. Notice that the cover has two holes for the clip installation, depending on from which side the wires lead to the solenoid valve.
- Reconnect the truck battery.



4.8-2

Install the Waterman Cover as follows:

- Secure the cable assembly with the clip as shown.
- Place the cover on the solenoid, and torque the cover capscrews to 30 – 45 in.-lbs.
- Reconnect the truck battery.

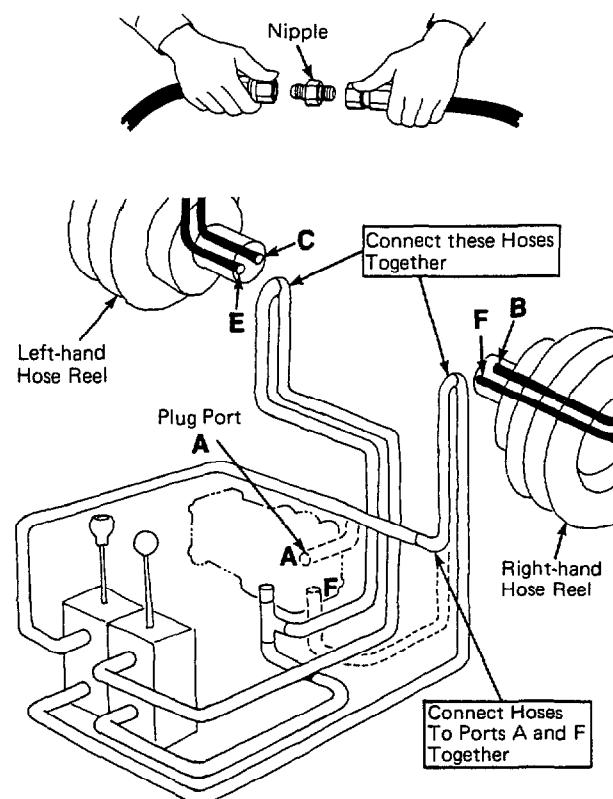


4.9

Flushing the Hoses

Prior to connecting the truck system to the attachment, the hoses should be flushed. Flushing will remove contaminants that might damage the valves and cylinders.

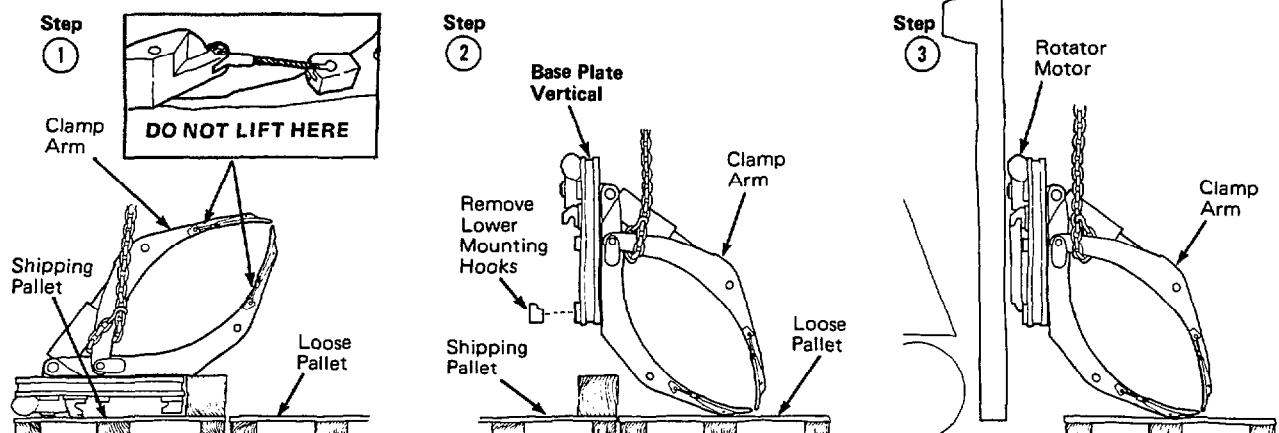
1. Connect hoses together using a nipple as shown.
2. Start the truck and actuate both auxiliary valves for about 30 seconds in both directions. This causes oil to carry any debris left in the hoses to the truck hydraulic tank and filter. Stop the truck.
3. Reconnect the hoses as shown on page 13-44.



4.10

Attachment Installation

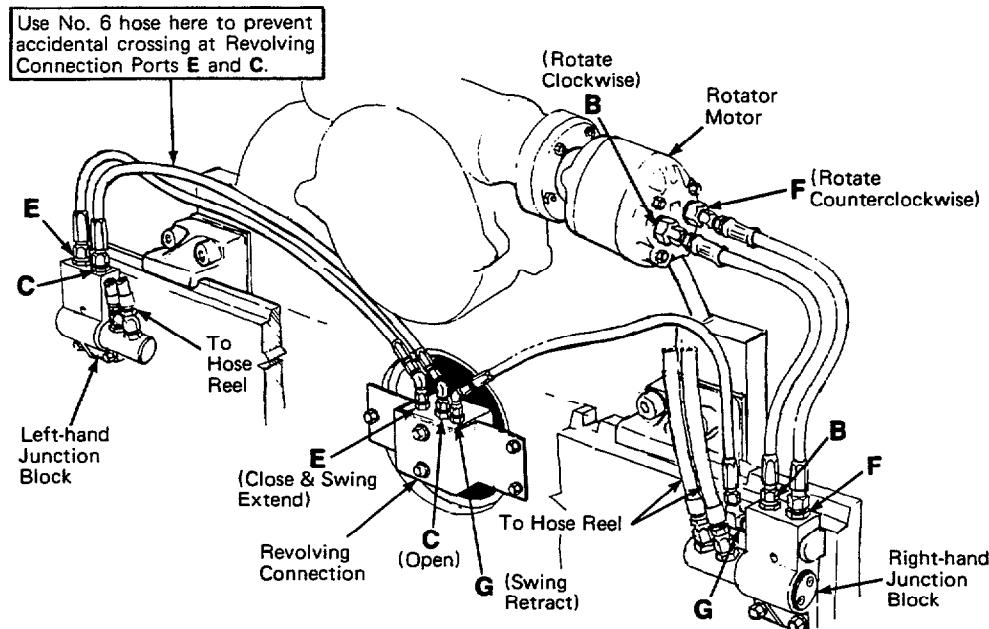
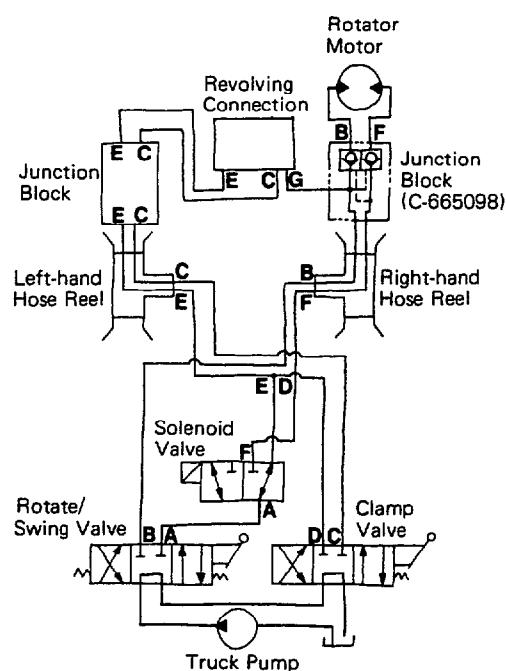
1. Wrap two chains around the clamp arm near its pivots as shown.
2. Put a loose pallet next to the shipping pallet as shown in Step 1.
3. Using a suitable hoist, slowly raise the attachment. Let the swing arm pivot on the support block and rest on the loose pallet. Continue raising until the attachment baseplate is vertical. Remove the lower mounting hooks. See Step 2.
4. Drive the truck in position and raise the carriage to engage the attachment upper mounting hooks. Make sure the attachment is centered on the carriage and make sure the stop block on the upper left-hand mounting hook is engaged in a notch on the truck upper carriage crossbar. See Step 3.



4.10

Attachment Installation (Cont.)

5. Measure the hose lengths required to plumb the attachment. Assemble the hoses and fittings, or, use Cascade Attachment Installation Kit C-665339, which contains the required hoses and fittings.
6. Flush each hose with hydraulic oil to remove any debris that might contaminate the attachment. Cap both ends of the hoses.
7. Lower the truck carriage and back the truck clear away from the attachment.
8. Install one end of each hose assembled in Step 5 to the attachment revolving connection and rotator motor as shown below.
9. Install the attachment onto the truck carriage as described in Step 4. Do not pinch the hoses.
10. Install the lower mounting hooks and torque the capscrews to 85 – 90 ft.-lb.
11. Remove the lifting chains.
12. Connect the attachment hoses to the truck junction blocks. The Plumbing Diagram on page 13-44 illustrates the entire truck/attachment hydraulic system correctly plumbed.

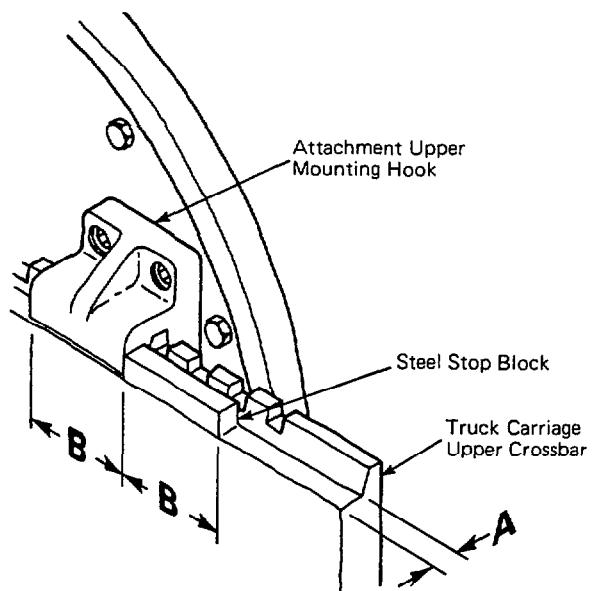


4.11 Attachment Stop Blocks

Cascade recommends that a steel stop block be permanently welded on each side of the truck carriage upper crossbar adjacent to each attachment upper mounting hook as shown.

To perform the installation:

1. Select square steel stock with a width about equal to the flat of the carriage upper crossbar (dimension A).
2. Cut two blocks from the stock, each about as long as the width of the attachment upper mounting hook (dimension B).
3. Position the blocks adjacent to the upper mounting hooks. The blocks should not extend behind the flat of the carriage upper crossbar (dimension A).
4. Weld the blocks in place. Make sure you protect adjacent hoses and hydraulic components from weld splatter.



4.12 Testing Prior to Operation

Check the level of the truck hydraulic tank and top-off if necessary. Then start the truck and test the attachment as follows to make sure it operates correctly.

1. Move the rotate/swing handle forward (or down). Do not press the button on the control knob. The attachment swing arm should extend, as viewed from the driver's seat.
2. Move the rotate/swing handle rearward (or up). Do not press the button on the control knob. The attachment swing arm should retract.
3. Press the button on the control knob. Move the rotate/swing handle forward (or down). The attachment should rotate counterclockwise. Return the handle to neutral and release the button.
4. Press the button on the control knob. Move the rotate/swing handle rearward (or up). The attachment should rotate clockwise. Return the handle to neutral and release the button.
5. Move the clamp handle forward (or down). The clamp arm should open.
6. Move the clamp handle rearward (or up). The clamp arm should close.
7. Check the entire hydraulic system for leaks.
8. Operate the attachment through several cycles to purge air from the system.



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